June 1995 Issue

Radio Fun

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"The beginner's guide to the exciting world of amateur radio."

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Radio "Pen Pals"

These YLs prepare a package of souvenirs and info for friends they met —on the air—from other schools. Read about them on page 26.

To QSL, or not to QSL?

For those of you disinclined to send QSLs, here's something to think about:

The initial cost of an HF rig runs anywhere from $1,000 used to over $5,000 new. In addition to this, most hams have an assortment of VHF/UHF mobiles at about $500 each; hand-held transceivers at $300 each; computers/packet equipment at $400-plus; assorted station accessories, antennas, and the like.

Because of the prohibitive cost of all of this (especially if it were to be done all at once, instead of accumulated over many years), there is a lot of truth to the old adage, "The only ham with a decent radio setup is a retired ham (who's been accumulating the stuff all his life)."

By comparison, a QSL card (in quantity) costs anywhere from three to five cents each, plus 20 cents of postage. This quarter that a QSL costs us is *less than a tenth of one percent the cost of our entire ham stations.*

Do a lot of QSOing? You might think that having to send out many QSLs for all that heavy-duty contesting you're doing may be expensive. Here's another way of looking at the cost of a QSL card: If you keep your rigs on for approximately one-half hour (depending on your local electricity costs), *especially* if you're the high-power type running the legal limit, you have in one contact just exceeded the cost of one QSL card (*particularly* if you figure electricity plus wear/depreciation on the equipment you just used).—Klaus Spies WB9YBM

Amateur Radio Activity Expands Rural Island Schools Contact

Lying off the rock-bound coastline of Maine are approximately 3,000 islands. Of that number, one-third are simply small rocky outcroppings and ledges that remain above water at high tide, another third are undeveloped islands that are primarily nesting grounds for numerous species of birds and other wildlife, and the remaining third have been exposed to some level of development by man. This last third, 1,000+ islands, have seasonal communities varying in size from just a few individuals to large summer populations of 4,000–5,000 residents. However, there are only fifteen islands that support *year-round* communities. Fourteen of these *maintain schools.*

Three mid-coast islands (Islesboro, North Haven, and Vinalhaven) operate full K-12 programs. The largest school is on Vinalhaven Island with over 200 students. Peaks Island off of Portland is a large K-5 school of 100. The older children commute daily to mainland middle and high schools via ferry. Monhegan Island School and Cliff Island School have the smallest school populations of *four* students each, with Frenchboro Island School educating eight children. Nearby Swan's Island School serves 50+ K-8 students. The remaining island schools (Islesford, Great Cranberry, Matinicus, Isle au Haute, Chebeague, and Long Island) vary in size from the mid-teens to the low twenties in enrollment and are one- and two-room schools staffed by one to three teachers each.

The Island Institute's *Island Schools Program,* under the guidance of former school principal Jim Wilmerding, offers a number of services to these institutions:

- On-going educational resources availability
- On-site visitation and consultation
- Inter-island transportation via the year-round boat *Raven* (on QSL card)
- Curriculum/program enhancement and project development
- Scholarship funding for post-secondary educational opportunities
- Annual school conferences, networking, workshops, and presentations

Within the area of curriculum and project development, the small multi-age schools on Frenchboro, Chebeague, Swans, Great and Little Cranberry Islands have incorporated the Institute's amateur radio and communications project: *Tune In The Islands.* Jim has made a number of visits to each of these island schools. He instructs students, parents and teachers in the basics of radio communications and sets up a full VHF/HF station establishing exciting

Continued on page 5

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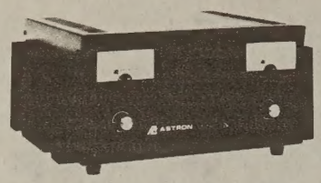

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SL-11R	•	•	7	11	2⅝ × 7 × 9¾	12
SL-11S	•	•	7	11	2⅝ × 7⅝ × 9¾	12
SL-11R-RA		•	7	11	4¾ × 7 × 9¾	13

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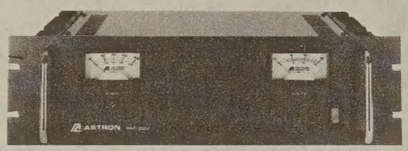
RS-4L	3	4	3½ × 6⅛ × 7¼	6
RS-5L	4	5	3½ × 6⅛ × 7¼	7

RM SERIES



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RM-12A	9	12	5¼ × 19 × 8¼	16
RM-35A	25	35	5¼ × 19 × 12½	38
RM-50A	37	50	5¼ × 19 × 12½	50
RM-60A	50	55	7 × 19 × 12½	60
• Separate Volt and Amp Meters				
RM-12M	9	12	5¼ × 19 × 8¼	16
RM-35M	25	35	5¼ × 19 × 12½	38
RM-50M	37	50	5¼ × 19 × 12½	50
RM-60M	50	55	7 × 19 × 12½	60

RS-A SERIES

MODEL RS-7A

MODEL	Colors Gray	Colors Black	Continuous Duty (Amps)	ICS* (Amps)	Size (IN) H × W × D	Shipping Wt. (lbs.)
RS-3A		•	2.5	3	3 × 4¾ × 5¾	4
RS-4A	•	•	3	4	3¾ × 6½ × 9	5
RS-5A		•	4	5	3½ × 6⅛ × 7¼	7
RS-7A	•	•	5	7	3¾ × 6½ × 9	9
RS-7B	•	•	5	7	4 × 7½ × 10¾	10
RS-10A	•	•	7.5	10	4 × 7½ × 10¾	11
RS-12A	•	•	9	12	4½ × 8 × 9	13
RS-12B		•	9	12	4 × 7½ × 10¾	13
RS-20A	•	•	16	20	5 × 9 × 10½	18
RS-35A	•	•	25	35	5 × 11 × 11	27
RS-50A	•		37	50	6 × 13¾ × 11	46
RS-70A	•		57	70	6 × 13¾ × 12⅛	48

RS-M SERIES

MODEL RS-35M

MODEL	Continuous Duty (Amps)	ICS* (Amps)	Size (IN) H × W × D	Shipping Wt. (lbs.)
• Switchable volt and Amp meter				
RS-12M	9	12	4½ × 8 × 9	13
• Separate volt and Amp meters				
RS-20M	16	20	5 × 9 × 10½	18
RS-35M	25	35	5 × 11 × 11	27
RS-50M	37	50	6 × 13¾ × 11	46
RS-70M	57	70	6 × 13¾ × 12⅛	48

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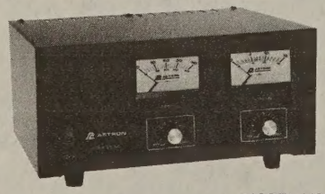

MODEL VS-35M

- Separate Volt and Amp Meters • Output Voltage adjustable from 2-15 volts • Current limit adjustable from 1.5 amps to Full Load

MODEL	Continuous Duty (Amps) @13.8VDC	@10VDC	@5VDC	ICS* (Amps) @13.8V	Size (IN) H × W × D	Shipping Wt. (lbs.)
VS-12M	9	5	2	12	4½ × 8 × 9	13
VS-20M	16	9	4	20	5 × 9 × 10½	20
VS-35M	25	15	7	35	5 × 11 × 11	29
VS-50M	37	22	10	50	6 × 13¾ × 11	46
VS-70M	57	34	16	70	6x13 1/4 x 12 1/8	48
• Variable rack mount power supplies						
VRM-35M	25	15	7	35	5¼ × 19 × 12½	38
VRM-50M	37	22	10	50	5¼ × 19 × 12½	50

RS-S SERIES

MODEL RS-12S

- Built in speaker

MODEL	Colors Gray	Colors Black	Continuous Duty (Amps)	ICS* Amps	Size (IN) H × W × D	Shipping Wt. (lbs.)
RS-7S	•	•	5	7	4 × 7½ × 10¾	10
RS-10S	•	•	7.5	10	4 × 7½ × 10¾	12
RS-12S	•	•	9	12	4½ × 8 × 9	13
RS-20S	•	•	16	20	5 × 9 × 10½	18
SL-11S	•	•	7	11	2¾ x 7⅝ x 9¾	12

*ICS—Intermittent Communication Service (50% Duty Cycle 5min. on 5 min. off)

CIRCLE 16 ON READER SERVICE CARD

QLF

by Wayne Green W2NSD/1

Are You Illiterate?

How about that for an insulting start? Illiterate, indeed! Well, that isn't quite as stupid a question as it may seem at first glance. Let me put that slightly differently. How many books have you read during the last year? Or even during the last month?

A recent article mentioned that of 100 applicants for $19,000 scholarships to a major college, only one student had read a book of any kind other than those required by the school. And that student had read only one book. A survey showed that on the average our teachers read only one book a year. Just because you can read doesn't make you literate. So I ask, are you illiterate? And that means have you read any books lately.

If you haven't read any books, what are you going to talk about when you are on the air? Please, please, don't tell me you are going to waste your time and the other chap's with a stupid recitation of your rig, antenna, and maybe the weather. Surely there must be *something* you can talk about which will be of at least the slightest interest. Or maybe not.

One of the reasons I go off on all sorts of tangents in my editorials is to show by example that there really are a wide variety of things you can talk about. At the very least you can say, "Hey, did you see what a bunch of crap Wayne wrote this month?"

Have you been anywhere recently? The chances are good that I've been there too, so we'll have something to talk about. Or have you built a piece of equipment recently? Tell me about it! How about the movies? There aren't many worth the time, but now and then there's a corker. If you're interested in music I'd love to know about any outstanding CDs you've found recently.

Maybe you'd like to do some ham pioneering. It's desperately needed. We haven't done anything to pay our way from a technical viewpoint in years. How about coming up with a way for hams to work duplex? You know, like the telephone, where you can both talk at once? This one-way broadcasting we've been doing for the last 80 years sucks. If you separate your antennas a bit and use a separate transmitter and receiver, that might be a good start.

Up until 1939 hams on 160m used to transmit on one end of the band with low power and receive on the other, allowing them to just sit and talk. We'd build up groups doing that and it was great fun. Like being in the living room with friends talking. The FCC made a rule preventing AM rigs from being left on the air that way in January 1939. Now that we have sideband we can do it again without the FCC harassing us.

Do it and write about it so we'll get more hams working duplex. Maybe set up some special frequencies for duplex.

Not that there's any shortage of things that need inventing and pioneering. I'm just really fed up with one-way transmissions. And I'm not all that happy about getting on the air and contacting one person after the other who has nothing whatever to talk about except the make and model of his rig. If there's a story involved, fine. For some reason I seem to do my best antenna work when there's five feet of snow and the soldering iron drops out of sight every time I put it down. And my fingers freeze.

Are you a user or a doer? Are you contributing to the hobby in some way? I don't have to go into detail on that idea. Are you a taker or a giver? Are you trying new modes? Are you helping with your ham club? Elmering? Giving talks at local schools about ham radio? Writing articles for the ham magazines and club newsletters? For heaven's sake at least get started doing some articles or a column for your club newsletter. But watch out, the next thing you know you'll be made editor.

How many articles have you had printed in the ham rags? If you haven't anything to write about you must be a taker, not a doer. Tsk. We've got all those ham satellites spinning around up there, so what have you worked through them? If you aren't up to helping build a ham satellite, you can at least keep them busy, and write about your adventures for your club newsletter. And maybe for your local newspaper too. We desperately need all the promotion we can get in newspapers and magazines. When is the last time you saw ham radio mentioned in any of the consumer magazines? I don't remember anything in years.

How about dropping into a bookstore and picking up something to read? When I was in Sarasota (FL) the other day I came across a huge bookstore and ended up shipping home 60 books. Now all I have to do is find the time to read them. And please don't tell me you aren't interested in anything. Lordy, did our school system bum you out that much?

Changing your habit patterns isn't easy. If it was we wouldn't have so many people persistently killing themselves with cigarettes, so many fat slob men and big fat cow women. I was watching an exposé of welfare and it looked as if most of the women on welfare were just sitting there eating all day, watching TV. They were almost all sloppy cows. And most of 'em were in New Hampshire, too. We tend to get into ruts and stay there until death us do part.

Barnes & Noble claims that less than 50% of the people who buy books ever read them. I believe that. I visited a chap the other day who is a specialist in one field. I noticed when we were talking that he was surprisingly short on information once we were outside his specialty. When I visited his home I saw why. Hardly any books.

It's frustrating for me. There are so many things I want to learn. I want to yell, hey, wake up! Do you know that if the gravity constant was different by just one part in a gadzillion, the universe wouldn't exist? Ditto the electromagnetic force constant. It's almost enough to make you think. Say, how old do you think the universe is? Well, we don't know. What we do know is that most of the theories are proving wrong.

I like Sir Fred Hoyle's simile. Have you read any of his books? They're marvelous! He said that the likelihood of life getting started by accident has about the same degree of chance as a cyclone blowing through a junkyard and assembling a Boeing 747. Or of me calling CQ on 20m and not getting a recitation of the rig and antenna of my caller. I really don't give a hoot what you're using, any more than I want to know what make and model of telephone someone who calls is using. I'm on the air with the aim of finding someone I can talk with.

Increasingly, amateur radio is in direct competition for the attention of youngsters with the computer online services. When people have the option of an interference-free contact with just about any place in the world, without any worries about propagation, through the Internet; where they can select the interest they want to discuss with others; amateur radio had better offer something of more interest and excitement or it's going to blow away.

The information and communication superhighway is a technological bombshell for amateur radio, so we'd better shape up . . . or ship out.

For myself, I find that more and more, I'm using my fax machine to communicate with friends around the world instead of 20m. RF

Newcomers

by Wayne Green W2NSD/1

Dear Ex-Reader

The first two issues of *Radio Fun* you've received were free—a sort of "welcome aboard" present I send to newly licensed hams. If you are not yet a paid subscriber, I hope this will trigger you into a subscribing frenzy, both to *Radio Fun*, and *73*. This is a fun hobby with all kinds of interesting things to do and learn, but you need a monthly shot of excitement to keep you going.

For the price of a dinner in an average good restaurant ($30) you can get a year's worth of both publications. This will keep you up with what's going on and help you find out how to get in on the fun thousands of hams are having with the hobby, whether it be sending packet messages or going on a DXpedition to St. Pierre.

If you're short of money, go for just a *Radio Fun* subscription for $12.97 a year.

You'll get a load of my editorials in both publications, though they're longer and cover much more territory in *73*. Some people love 'em, and some hate 'em, but almost everybody reads 'em. My goal, both in publishing my magazines and writing my editorials, is to help you enjoy the things I'm enjoying, to educate, to open new worlds for you, to keep you from being a crummy couch potato, to get you thinking, and perhaps to help you be more successful in life.

The $30 price for both *Radio Fun* and *73* is to help get you hooked. You really should pay $39, the regular subscription price. Tell you what, if you find you're really looking forward to each issue, you can lift a tremendous load of guilt from your mind by sending me the extra $9. Or by ordering my 360-page *Declare War* book for $10 from Uncle Wayne's Bookshelf.

As a new ham I'm assuming that you are intelligent, interested in technology, and adventurous. This is the picture I have of you in my mind as I write my editorials and I help Nuge (Mike Nugent), my Senior/Tech Editor, pick the articles for us to publish in both magazines. Sure, we have some serious nut cases (mostly Extra Class hams, oddly enough), but 99% of my mail is from hams I wish I had the time to meet and make my friends.

You're going to enjoy the top-notch columnists I've rounded up to help you have more fun. And to learn more. No fair just ragchewing and not learning. That's cheating. Cheating yourself, most of all. It's fun learning how ham Teletype works. It's a ball building a kit and actually getting it to work! Wait'll you start getting some gorgeous pictures via Clover slow-scan television from Africa. You'll be driving your family and friends to distraction flashing beautiful pictures from weird places around the world.

It's exciting to get a new piece of ham gear and put it on the air, whether it's a one-watt rig built into a match box, or a new kilowatt linear. My magazines run circles around the others when it comes to reviewing new equipment. Once you get to know what you are doing, I'd like to see what you can do in reviewing something you've bought. Both of my magazines are written almost 100% by the readers. Like you.

The basic idea is to provide you with a monthly jolt of fun and excitement to keep your interest in amateur radio going. I try my best to get you to do more than just get on a repeater and talk about nothing much for the rest of your ham life. I finally sat down the other day and made a list of the hobbies that make up amateur radio. I counted 53 aspects of the hobby that I've had fun with so far, plus 20 more that are still ahead for me. Of course I've been at it for a while. I got started back in 1938 and have been having the time of my life ever since.

For an almost insignificant charge on your credit card you'll get a monthly injection of exciting news of what's going on in amateur radio. You'll get articles on how to get in on the fun amateur radio has to offer, from working DX to repeaters, fox-hunting, packet radio, slow-scan, RTTY, amateur television, contests, home building of equipment, reviews of the newest equipment, reviews of the best kits on the market, and so on. You'll be getting the ads for the neat new stuff the ham industry is cooking up for newcomers.

What's coming in the hobby? It won't be long before your receiver will automatically read out the call of every station you tune in. Or you'll be able to set your receiver to tune the band, looking for specific calls or prefixes. How long will it be before all ham communications are duplex so you can actually talk with other hams, just like the telephone? Big changes are coming that you'll want to know about.

You know, while you're at it, you could do a lot worse than get your most valuable ham asset going—your library. You'll want to subscribe to *73* as well as *Radio Fun*. I was just thinking back, and you know, every major change in the hobby in the last 40 years has been instigated and pushed by *73*. When sideband came along the other magazines paid it little note, while *73* ran tons of articles on the subject. I even went on a trip around the world visiting 23 countries and operating on SSB from the plane all the way to help promote this new mode. Then came repeaters. *73* was the only ham magazine pushing this new technology. I also published a monthly *Repeater Bulletin*, which grew into a full-scale magazine. As a result, this soon became the most active aspect of the hobby, with standardized channels from coast to coast. Would this have happened without my repeater symposiums all around the country, plus hundreds of articles in *73* and book after book on the subject?

And so it's gone with slow-scan, packet ATV, etc. Every new mode has been promoted almost solely by *73*. When microcomputers came along *73* was the first to cover them in depth.

So send me a check for $30, or call in your credit card number, and let's make sure you won't miss an issue (603-924-0058). Most of the hams I entrap into subscribing keep right on subscribing for the rest of their lives. Well, what better amateur radio reference library can you have than a shelf full of *73*s?

. . . Wayne W2NSD/1

Field Day

by Mike Bryce WB8VGE

Every year at this time, most of the ham radio operators in this country take to the woods, hills and open plains. Yup! It's got to be Field Day.

Perhaps your introduction to ham radio occurred during a Field Day operation. Many of the clubs offer public services, such as free messages via ham radio. We set up in shopping malls, public parks, and in the middle of corn fields. Newspapers and TV stations usually highlight hams during Field Day. The public is always invited to stop by. I know of several cases where a member of the public stopped by and ended up staying the whole weekend. They even helped take down the antennas as well. Of course, soon after Field Day, they became licensed ham radio operators.

What exactly is Field Day? Ask five hams that question and you'll get nine different answers. Field Day accommodates many diverse functions of ham radio. For some, Field Day is a contest that must be won at all costs. For others, Field Day is an event for having a good time with family and friends and not worrying about winning anything. Field Day also means setting up and running a complete amateur radio station in a non-emergency backdrop instead of the real thing. And for me, I like to try out new receiver and transceiver designs while using solar power. I like making several contacts with the least amount of work possible. In fact, during the last several years, I have even kept a log of my contacts.

Somewhere between both ends of this thinking lays the heart of Field Day: setting up an amateur radio station and making contacts from coast to coast under less than perfect conditions. Of course, the group that makes the most contacts wins the bragging rights until the next year.

Setting Up for Field Day

It makes no difference where or how you set up your station for Field Day. In fact, you can operate Field Day right at home using commercial power and your ready-to-use antennas. But, that's not nearly as much fun as taking a box of stuff out into the great outdoors and setting up in a hayfield. Let's not forget the biting red ants and the mosquitoes equipped with landing lights!

Oh, forget about that SB220 and the tribander up at 80 feet, too. This time you might have to work Field Day with nothing more than 100 watts input to a dipole held up with duct tape! Don't feel like lugging around a 100-pound battery? Then really get into the swing of the moment with Field Day and QRP (use low power.) At times like these, you'll wonder what in the world you're doing out in a hayfield, running 2 watts of juice into a few feet of wire, just to have fun. That's Field Day!

Operating Field Day

There are as many ways to operate Field Day as there are operators. It all depends on the type of gear you'll be using, how well your antennas work, and how many operators you have. But it really boils down to two separate styles—the channel master and the stalker.

A channel master holds onto the frequency and just calls "CQ Field Day" and never moves. His or her antenna systems are usually above reproach. In fact, at night you can see the RF leave! Operation like this can be fun if you're new to ham radio or to ham radio contesting. It goes somewhat like this:

First you find a spot that is busy with several different stations on. During a lull in the calling, you jump in and start calling "CQ Field Day" before anyone else. If your death ray beam antenna is working, other stations will begin to answer you back. You keep this up until you can no longer talk or another channel master takes over the frequency.

The stalker works entirely differently. You start by moving to either the high end of the band or the low end. Then you slowly tune up or down in one direction. If you start at the high end, you tune down, never up and down. As soon as you hear a channel master calling "CQ Field Day," you jump in with your call and hope for the best. The channel master will only return to the strongest stations calling him, so you can take up to four tries before moving on to the next channel master. When you reach the other end of the band, spin the tuning knob back up to the high end and start moving back down once more as you stalk your stations.

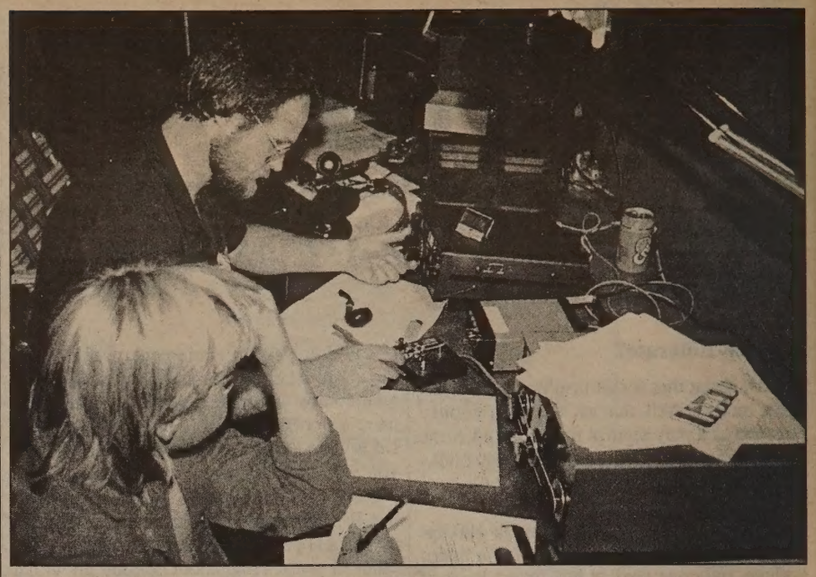

Photo A. Joe WB8RVM works the CW station at W8NP. In the background is a complete 1957 radio setup. We made quite a few contacts using the older gear.

As I enjoy running QRP at very low, low power levels at Field Day, I like to change the stalker method a bit. Instead of moving up or down across the band, I band-hop back and forth. I call this the "Columbus" method, as you discover and land on a station.

Antennas for Field Day

Nothing beats a hot antenna for Field Day. Nothing! But, in my case, I've never had a really good antenna up, and I end up using some sort of thrown together antenna with a tuner to get on the air as quickly as possible. Just remember to get the antenna up in the clear and as high up as you can. I also don't believe in going overboard with the death ray antennas. I let the other guys bust their butts putting up the killer antennas so *they* can hear *me* with my QRP signal. I let the guys in California beam to me in Ohio instead of erecting antennas to beam to them. That way, I can have a simple antenna that will allow me to make many a contact, without the hassle of a heavy-duty antenna system.

More Power to You

To get the real feel of an emergency communications set up, you really have to run your rigs from some source of power besides the local power company. Gasoline generators are by far the most popular way to supply power at Field Day, but anything goes! In fact, you get extra points for running your Field Day system with battery power only. And there are more bonus points for using an alternative energy source such as solar, wind, hydro or people power! Some of the sources of power that have been used in the past are rather peculiar.

Have Fun at Field Day

This has always been high on my list of Field Day activities. If you don't have fun at what you're doing, why do it in the first place? I don't even keep much of a log anymore at Field Day. I don't send in my results to the ARRL. I really don't care what my rate of QSOs per hour is. I'm out to enjoy myself and to have fun!

All right, you're not into contests, you're not into camping out in the middle of a hayfield, but give Field Day a try. Just about every ham club sponsors some type of Field Day setup. Join the group and have fun. Is there a drawback to setting up for Field Day? Just one. You'll hear CW coming out of the TV, the toaster, the washing machine, and everything else for a week afterwards. RF

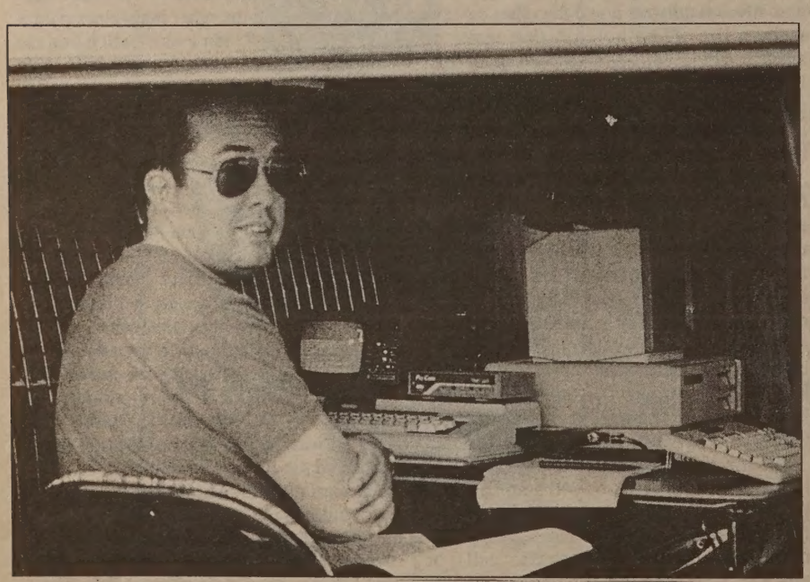

Photo B. Here's Steve NØCZV manning the packet station. A PC was used to score and dupe the entire weekend's worth of contacts.

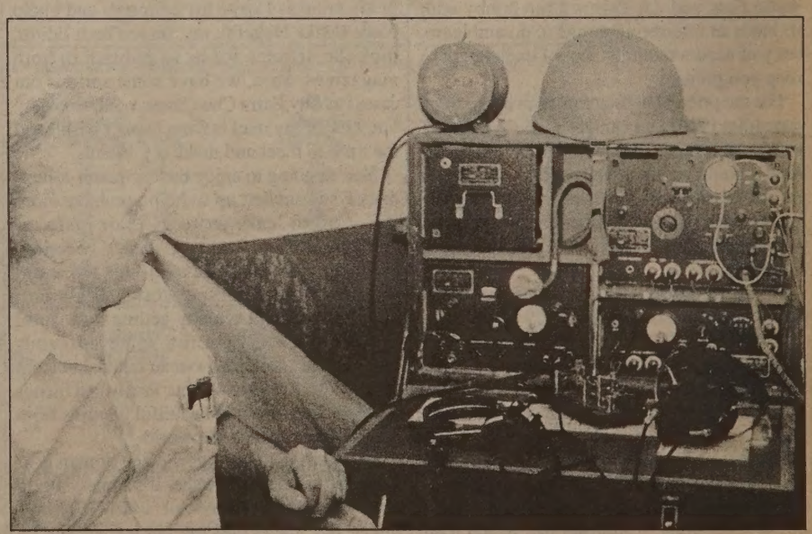

Photo C. Perry W8AU and a complete field radio set from WWII. Yes, it did work, and we made some contacts on it.

Radio Fun

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letters

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Frank Rumph KD4DZI, Palmetto FL I read your article where you said you were on the submarine *Drum*. Maybe you know the *Drum* is still afloat, but if not it's in Battleship Park, Mobile AL. Several years ago my wife and I were there and went through it and the Battleship *Alabama*.

Your *73* magazine is excellent. Keep up the good work.

Brent-Victor W. Putnam, East Falmouth MA Thank you for responding to my letter. I understand that time is hard to come by—especially if you're managing several enterprises—so I do appreciate the reply.

In your letter to me, you mentioned that you had read several books relating to theories about the origin of the universe, so I thought you would be interested in a recent (December 1994) article in *Sky & Telescope*. Geoffrey Burbidge and Adelaide Hewitt write in "A Catalog of Quasars Near and Far," that perhaps red shift is not an indicator of distance for all quasars, as had been believed by the mainstream astronomers. They are among a few who feel that "at least some QSOs are relatively nearby, and that a large fraction of their red shift is due to something other than the expansion of the universe."

I found this whole idea fascinating—that perhaps QSOs weren't as far as we thought. I think you had touched on this in your letter (or one of your editorials)—the idea that perhaps the universe is actually 'steady-state' and not expanding. That red shift could be caused by some other process that we are not yet aware of. Fascinating. You should get a copy of the article for your file cabinet.

On a different note: Have you seen the April 1995 issue of *QST?* For years I have tried to find every excuse not to join the ARRL, and you have always given me enough reason (besides, *73* is $10 cheaper than *QST!*, but this takes the cake).

The article "The ARRL Turns Toward Tomorrow" describes the League's long range planning. Specifically, it includes a look at the 'core' membership of the ARRL, as well as what the League believes the 'core' membership should look like.

I quote: "Board members . . . must take into account . . . the "core membership" of the League. . . . [the ARRL] must meet the true needs of this group first and foremost. Thus, all of [the League's efforts] must be designed to directly or indirectly benefit the core member."

The article goes on to describe the current 'core' member as being an affluent white male over 40 years old. Then, in what is the most appalling part of this entire scam, they describe the future core member as being an affluent person over 40 (without regard to sex or race).

Am I the only one who finds this appalling? Here the ARRL just admitted, in print no less, that they must focus their time and energy on old, white men; that the League exists not for amateur radio, but for old white men.

What about bringing youth into amateur radio? What about using amateur radio to help the disadvantaged (i.e., poor) learn new skills and become self-supporting and contributing members of society? What about bringing amateur radio out of the 1950s?

In just three paragraphs, the ARRL managed to confirm that they are not only an exclusive club for old white men, but that that is all they ever want to be.

If I ever needed a reason not to join the League, now I have it. When you're right Wayne, you hit the bulls-eye.

Rick KN4CV Uncle Wayne—I am amazed by you. Always looking, always reading, always learning. "Screw E-Mail?" You really need to give Internet a try. The business opportunities on the net are unbelievable! See our Web pages: http://edco.com/trophies/. RF

Amateur Radio Expands

Continued from page 1

on-the-air contacts with a variety of schools and individuals worldwide.

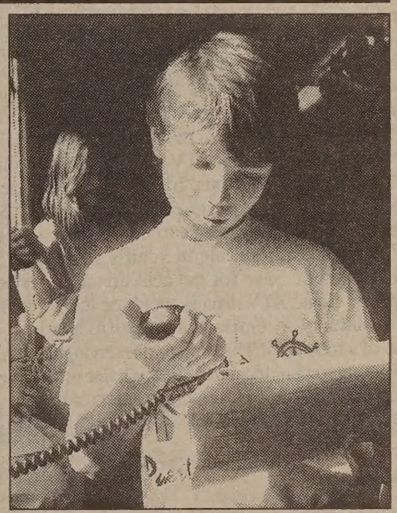
Each of the 14 island communities is unique, but sometimes share similar levels of isolation. This is especially evident during the long, cold, dark months of New England winters on the water. Simple necessities such as transportation to and from that mainland become major ordeals, even with ferry service to islands close to shore. It doesn't take much to blow up 10- to 15-foot seas that can challenge any ferry trip! Islands such as Matinicus, lying 25 miles offshore, depend upon a ferry visit only *once* a month! The small community on Monhegan Island, 10 miles off of Port Clyde, looks forward to seeing the small 65-foot ferry *Laura B.* three days a week, weather permitting.

It is easy to forget that everything . . . *everything* that is needed to sustain life on an island; food, fuel, mail, etc, comes via the water. If the ferry or lobster boats cannot get out, the tether to the mainland is temporarily severed. It is a very fragile lifeline that often gets stretched to its limit. The sharing of experiences and information over ham radio contacts hopefully plays a small part in easing this isolation that is an integral characteristic woven into the heart of island living.

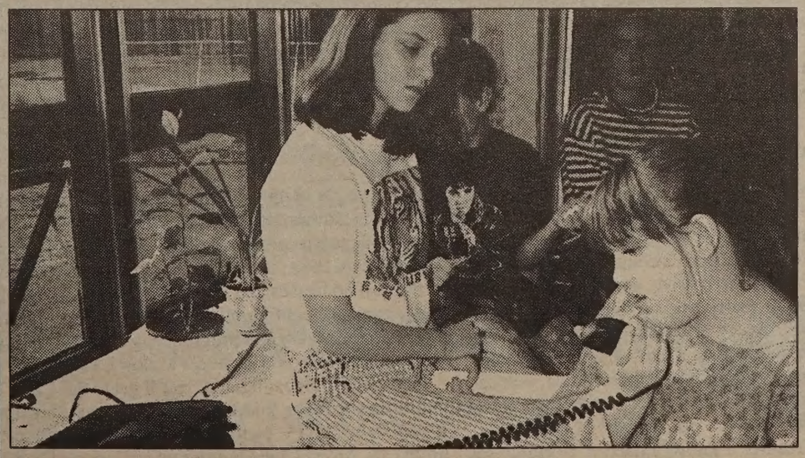
Jim travels with a Yaesu FT-900AT, Astron 12 volt power supply, G5RV Dipole, and a 17 meter half square antenna. Students easily take part in setting up the antennas, thereby feeling a sense of accomplishment and ownership in the project. Many exciting local and DX contacts have been made with this convenient antenna arrangement.

Jim's on-going contacts with Carole Perry WB2MGP at Intermediate School 72 on Staten Island have provided wonderful exchanges between her students and the island school youngsters. Videotapes and scrapbooks (100+ at the last count!) have been shared between Maine and New York. Recently, Jim sent lobsters to the school, where they were the "center of attention" for a schoolwide "Lobster Fest" arranged by Carole. With television coverage of the festivities providing great PR, Jim and Carole had scheduled a 40 meter contact between IS 72 and Chebeague Island School. Unfortunately, Mother Nature stepped in with a snow/ice storm, closing the Maine schools and halting travel. Not to be outdone, nor to disappoint the NYC children, Jim kept his schedule with Carole from his own island home farther down the coast. He ran phone patches to Chebeague Island School Principal Ron Cote and teacher Pat Mc Gillicuddy, enabling them to talk with Carole and IS 72 Principal Barbara Glassman. According to Carole, the day was a huge success showing amateur radio at its finest; contributing to a unique and interesting cultural exchange between the different schools.

A number of the other island schools have expressed interest in getting on the airwaves and will soon join in on the fun. Please contact us if you would like more information, to arrange a schedule, or to establish contact with these schools.—Jim Wilmerding N4MDC, Director, Island Schools Program, 60 Ocean Street, Rockland ME 04841.



Swan's Island School student Devan in QSO with Carole Perry WB2MGP and her students at IS 72 on Staten Island, New York.



Swan's Island School's students Lindsay & Carrie talking with Bob Watts KC1CW and his students at Vinalhaven school on Vinalhaven Island, Maine.

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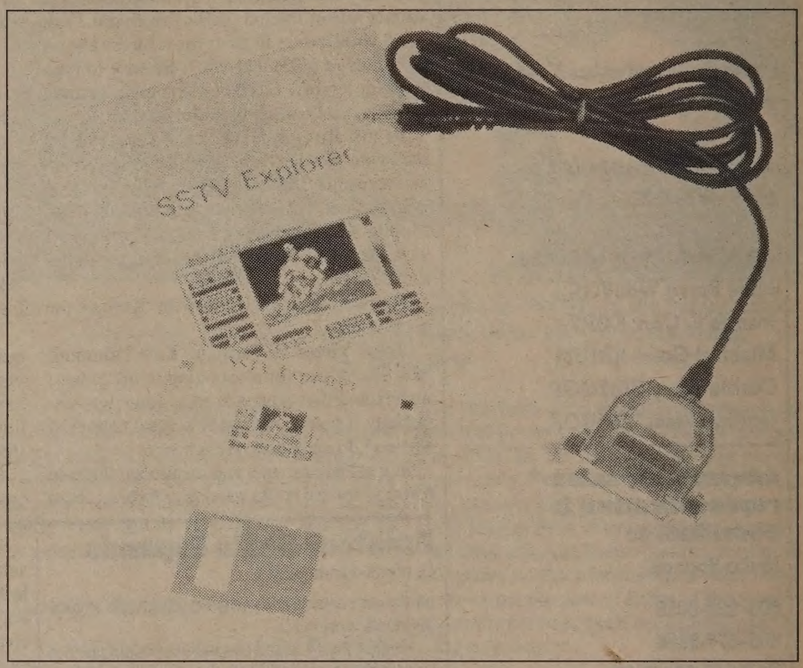
The SSTV Explorer

Watch the world go by.

by Michael Jay Geier KB1UM



SSTV Explorer system components

We hams love to communicate. From CW (Morse code) to SSB (single sideband), voice to RTTY (radio teletype), we can find just about any way to get some information across the ether to another radio amateur. But what about actually seeing the other operator? What about television?

Naturally

Hams have been doing TV for many, many years. In fact, we have two kinds of TV. First, there's the usual kind, just like what you see on your TV set every day. We call that ATV (amateur television), and we do it in full color, with the same frame rate and other basic signal standards the commercial broadcasters use. Because we send about the same amount of information they do, our ATV system is subject to the same limitations. In other words, the high information rate, nearly four million pieces per second, requires us to use VHF or UHF frequencies, resulting in a fairly short-distance system. Save for the occasional atmospheric event, ATV usually won't go more than 60 miles or so, unless you happen to live on top of a mountain! That's more than enough for videoing to your local friends, but it doesn't do you much good when the other operator is in, say, Australia.

Slow Down!

We have another way to send pictures, though, and this one will get you all the way around the world! We call it SSTV, or Slow-Scan TV. What does that mean? All it means is that we slow the "scan rate," or rate at which the picture is sent, way down until the amount of information being sent each second is low enough that it will fit into a 3-kHz voice channel. That lets us send it through the microphone input of any HF (high-frequency) radio. Send pictures through a microphone jack? How does it work?

Hold It

Very early SSTV equipment used very slow-scanning cameras and picture tubes. The tubes, much like radar tubes, had glowing phosphors which kept glowing for quite a long time after they were struck by electrons. So, by the time the bottom of the picture was being scanned, the top was still visible. It worked, but it was crude. For one thing, it required the subject to be perfectly still in front of the camera during the entire scan, which might be as long as eight or more seconds! That pretty much left out live subjects. And, the top of the received picture was pretty dim by the time the bottom finally came along.

Once digital circuitry was introduced, it became possible to "snap" a normal TV camera's output, store the picture in memory and read it out at the slow-scan rate. Such a digital slow-scan device is called a scan converter. The scan converter quickly swept the old long-persistence phosphor system into history, and the digital method continues to be used today.

As scan converters became popular, various "modes" of picture transmission were developed. Every time better hardware became available, enterprising hams would use it to create a better transmission mode. Usually, that involved more memory, more detailed pictures, color, and longer transmission times to send all that extra information. Of course, picture quality got better and better; today, a good SSTV picture looks very close to normal television. Of course, you may wait as long as a minute for one frame, so motion is out of the question.

Scan converters have always been expensive, keeping SSTV out of reach for many of us. These days, though, many hams have a device which has video display, lots of digital memory, and the ability to access the memory in various ways. Sound like a scan converter? You bet. It is also, of course, a personal computer.

Enter the Computer

Why buy a scan converter when you already have a computer which can be made to do the same job? Today's computers, be they IBM type, Mac, or Amiga, are ideal for image storage and manipulation. Wisely, entrepreneurs have begun to produce SSTV systems based around computers. With most of the functions, including the scan-rate conversion itself, done in software, the extra hardware required is minimal; basically, it's a modem. So, costs can be low, while quality and functionality are quite high. The SSTV Explorer is an excellent example of a terrific entry-level SSTV system at a very low price.

What You Need

The manual states that, in order to use the SSTV Explorer, you need a PC-type computer with a 386 or better CPU, a meg of memory, a free serial port, a couple of megs of free space on the hard drive, and a VGA or better display. It really helps to have a good VGA card with a meg of display memory on it. The system will run on a less-capable VGA card, but image quality will suffer. In fact, you can run it on a 286 with 640K of RAM and a crummy 256K VGA card, but you won't get optimum results. I know; I tried it. Fortunately, most of us have better computers these days. By the way, it won't run on an old CGA 8088. Also, you can't run the Explorer under Windows, because reception of images requires very precise timing which can be interfered with by any menu programs. So, you must quit out of any kind of shell and run it from a DOS prompt.

What You Get

I call it an entry-level system for one reason only: The Explorer is designed only to receive SSTV; it does not transmit. Also, there is one mode it does not support, because doing so would require considerably more hardware. Luckily, that mode isn't used a great deal; the most popular modes are well supported. The SSTV Explorer comes with a small modem built into a 25-pin RS-232 connector, a cable, a software disk and a manual. That's all it takes! To get set up, you simply connect the cable to the audio output of your HF rig, plug the modem into one of your computer's serial ports and copy the software to your hard drive. You're all set to start receiving pictures!

How It Works

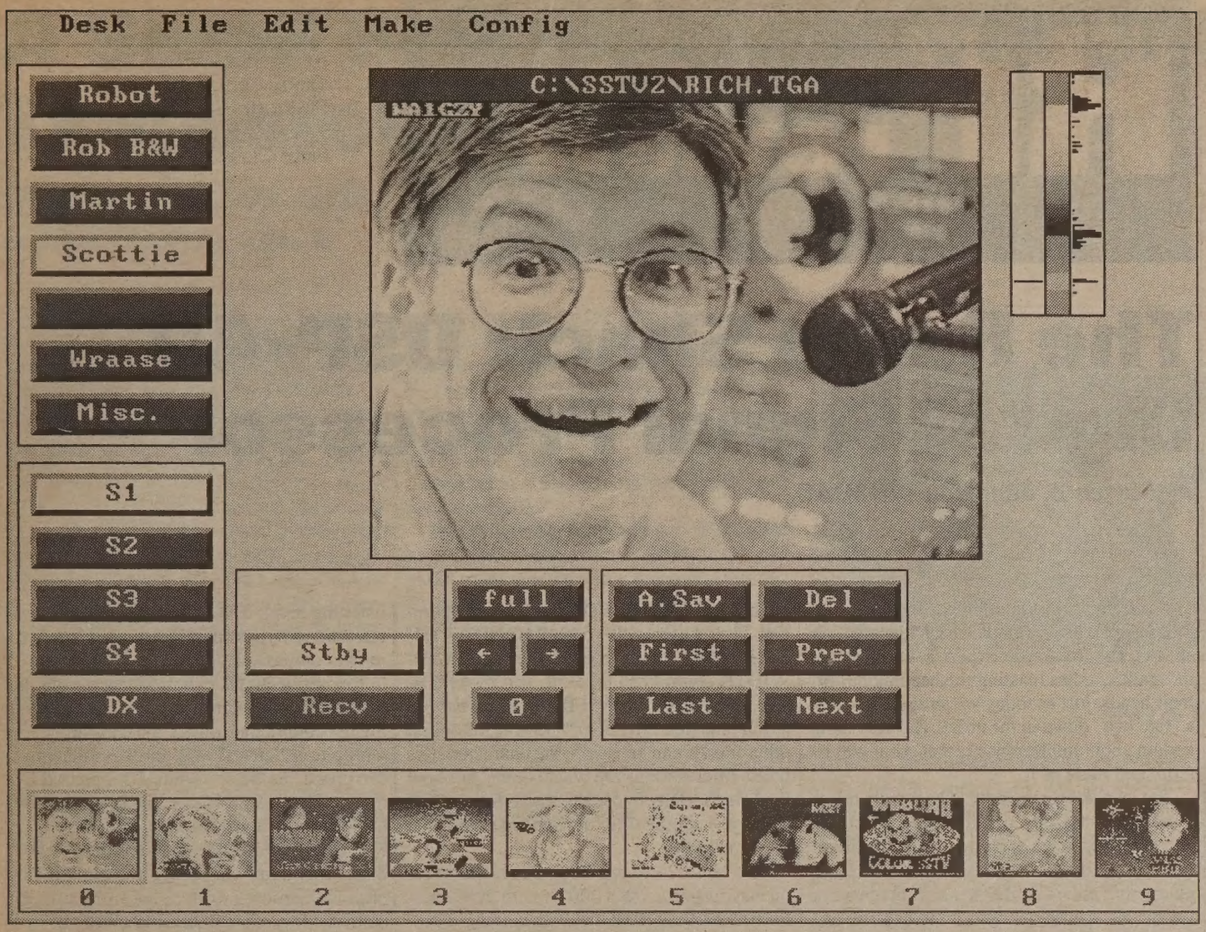
When you boot up the Explorer software, a simple installation process lets you set it all up for your computer's particulars. If you have a standard machine, that should be pretty easy, as the port addresses and such are already set up for a normal configuration. If, though, you have special needs, this program can accommodate them, from odd addresses to slow CPUs.

Once you're all configured, you'll get to the main screen. In the middle of it is a window which shows SSTV pictures as they come in off the air. Around it are buttons which let you select the various transmission modes, such as Robot or Scottie. At the top are pull-down menus in the Mac/Windows style. These let you select all the usual operations, such as file-save and such. To the right of the screen window is a very useful tuning indicator. It acts as a small audio spectrum analyzer, showing you the relative pitches of the audio tones which represent picture information. Even better, it displays a line which represents the video sync pulse. To tune in a picture, you just adjust your rig's tuning knob until that line is centered in a red box. The adjustment isn't critical, and the whole thing makes tuning a snap. It couldn't be easier.

What You See

By far, the most popular SSTV frequencies are 14.230 and 14.233 MHz, in the 20 meter band. Set your radio to USB and tune in some pictures! They have a distinctive sound, and, once you hear it, you'll never forget it. If you get set up before a picture is sent, the Explorer will decode the mode information sent at the beginning of the picture and automatically select the correct mode for receiving it! If you come in after the picture starts, though, you can still select the mode manually. Which one to select? Start with Scottie 1, which is the runaway favorite here in the US. If that won't work, try Robot 36 or 72. After awhile, you'll begin to recognize the various modes by their sounds. The Explorer cannot receive the Amiga Video Terminal (AVT) mode, due to its requirement of crystal-controlled timing in the decoder. For a while, AVT was quite popular, and you'll still hear people using it. But, Scottie has eclipsed it, and you'll have no trouble seeing Scottie pictures. In my experience, about 75 to 80 percent of all pictures are sent that way now.

As the picture comes in, it'll build up from top to bottom. Once it's complete, you can



Actual SVGA computer screen of SSTV Explorer's Virtual Control Panel

press a button and see it in full-screen form. If your reception's good, the effect can be quite stunning, with great color and detail. You'll see all kinds of things, from birds to postcards to snaps of live video of the other operator in the shack. It certainly adds a whole new dimension to the ham radio experience.

Cool Things

Due to the unpredictable nature of the HF bands, many pictures may have some degradation by the time they make it to your antenna. The SSTV Explorer has several noise filters and enhancers which can really help clean up a damaged picture. It also has some editing features which let you flip a picture upside down, reverse right and left, zoom in and out, and even reverse colors. If you have enough memory, it can also hold up to 10 pictures at once and let you switch between them.

The Explorer stores pictures as 320 x 240 pixels at 32,768 colors. So, even if you only have a 256-color display card, you can still see saved pictures in higher quality if you upgrade the card later. You can even save pictures automatically, so you can walk away and come back later to see what you snagged. This is a very useful feature, because there can sometimes be long periods of time between pictures, and it can get boring to wait around for another to be sent. I often like to start the Explorer up and walk away for an hour or two, sifting through the saved pictures later to see what's worth keeping.

Not-So-Cool Things

There's not much to complain about with this thing. I wish it had a noise-removal feature which could remove "hits" and interference by substituting the previous line of video. VCRs do that, and so do some SSTV systems. It should be a simple software function; I wonder why it isn't included.

The manual is well-written, but it assumes you know a bit about your computer's architecture and various MS-DOS terms. If you have a standard setup, you can get the system running in minutes. If not, though, you'd better know something about PCs; it can get messy. A simpler, more-detailed tutorial would be welcome.

Conclusion

For the price, you just can't beat this thing. If you've ever wondered what those noises on HF were, or if you've wanted to watch the pictures but couldn't afford a scan converter, you are in for a treat! The quality is excellent and the thrill of seeing the pictures roll in is unequaled.

By the way, if you have a General Class or above license, and you want to transmit, too, check out the Pasokon TV system; the SSTV Explorer is a receive-only version of it. The full Pasokon setup lets you transmit, and it also supports the AVT mode. Explorer or Pasokon, you can't go wrong. Finally, SSTV for all! RF

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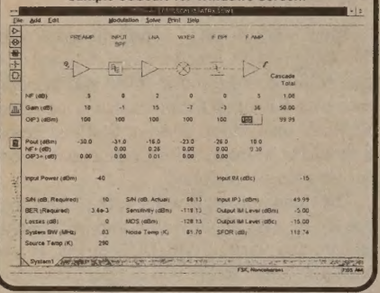

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The Radio Shack DSP-40 Digital Signal Processor

by Steven B. Johnston WD8DAS

The fight against interference has existed as long as radio itself. Huddled each night in their shacks, the first radio experimenters cursed the static crashes blasting the headphones off their heads, just as today we struggle to catch a "rare one" down in the noise. The only thing certain about interference is that there will be more and more of it.

The increasing popularity of ham radio brings more interference from QRM such as splatter and heterodyne whistles, while the proliferation of appliances, tools, vehicles, and computers that either deliberately or incidentally use the RF spectrum brings more impulse and buzz QRN. We can hope to reduce these emissions at the source—meanwhile, we must employ interference-fighting receive designs to manage the hostile radio environment.

The latest technology brought to the fight is Digital Signal Processing. DSP integrated circuits are available that can serve as extremely flexible "black boxes" which can be software-controlled to produce all sorts of audio and RF devices: signal generation, detection, conversion, and processing. Of particular interest are the audio processing designs; as the cost comes down these chips become practical as accessory noise and interference filters.

A quick look through a ham magazine or a walk around a hamfest will reveal quite a few vendors offering just such receiver accessories. DSP filters are very popular now, with retail prices in the $150-$300 range.

A new entry into the field is the Radio Shack DSP Noise Reduction System (catalog number 21-543). With a retail price of $79 it is the most inexpensive DSP accessory yet seen. Keeping the old adage "you get what you pay for" in mind, I purchased a Radio Shack DSP for evaluation. I hoped this new unit would deliver significant interference reduction at its reasonable price (the 30-day money-back guarantee offered security in case my worst fears were realized).

Housing and Controls

The Radio Shack DSP is housed in a plastic case roughly the size of a modern computer modem, and includes a bracket for mobile mounting. It is powered from 12 VDC. In addition to the DSP section, an internal speaker and audio amplifier with volume control are included, with headphone and external speaker jacks.

The DSP controls consist of two three-position rotary switches, an LED lamp, and a push-button to select DSP or bypass operation. The rotary switches control BANDWIDTH and FILTER. As one might expect, the BANDWIDTH control can be set to WIDE, MEDIUM, or NARROW. The FILTER knob has positions labeled NR, SSB, and CW, although other modes can be used—the characteristics of the filter settings are what counts, not how they are labeled. To use the Radio Shack DSP filter, you set the filter desired first, and then the bandwidth.

The NR setting provides a bandpass frequency response from 200 hertz to 2000 (narrow) to 3000 (wide) hertz, with automatic heterodyne notch rejection of up to -40 dB.

The SSB position sets the bandwidth to 300 to 3000 hertz in the wide mode, 470-2600 hertz medium, and 800-2000 narrow. The SSB selection also provides automatic tone-notching of up to -40 dB.

The CW mode bandpass is much tighter, with a response ranging from 270-1230 hertz (wide) to 600-900 hertz (narrow). Obviously, heterodynes are not notched in this mode, as the desired CW signals are reproduced as tones themselves! The reduced bandwidth provides an effective means to listen to an individual signal among many nearly cochannel stations.

> ***"Huddled each night in their shacks, the first radio experimenters cursed the static crashes blasting the headphones off their heads."***

Performance

The audio monitor amp performs well, with 5 watts of undistorted output. The internal speaker provides reasonable sound and eliminates the need for a separate speaker enclosure, a valuable feature when operating portable or mobile. Purists will prefer to attach an external speaker or 'phones for their favored sound.

Installation and setup of the Radio Shack DSP is simple. Route the speaker output from your receiver or transceiver to the DSP input via the 1/8" phone plug patch cord included. Connect the DSP to a source of 12 VDC power using the coaxial DC cable provided. Turn on the receiver and DSP unit, press the DSP button in and adjust the volume of the receiver for a flicker on the front-panel LED. Then adjust the DSP volume control for the desired listening level. The DSP push-button can be released to bypass the filter—very handy for in/out comparisons.

My on-the-air tests showed that the NR and SSB filters kill heterodynes very well, knocking out continuous tones almost instantly. Listening to 40 meters at night was amazing—the broadcast heterodynes disappeared like magic! The audio bandpass filtering helps fight QRM from stations on nearby frequencies. The CW filter is not quite as impressive—while the further narrowing of the passband indeed eliminates most interference from adjacent stations, there is a distortion on the desired signal that sounds raspy and somewhat unpleasant.

To simulate impulse noise, an elaborate test setup was employed: I parked my lawn mower under a back-yard antenna with the engine running. My old 3-horsepower mower is notorious for the racket it makes on HF. I wouldn't have known this, except that I usually manage to get my wife to cut the grass while I enjoy operating! Without this deal I would have been pushing it myself and never would have discovered the lawn mower's noise problems. This is a valuable arrangement—I hope you can work out a similar setup with your spouse or kids.

Beyond the usual benefits of a restricted audio bandpass, the Radio Shack DSP was not particularly effective on impulse noise like automotive (or lawn mower) ignitions. The limited audio bandwidth made the noise easier to tolerate, as it filtered the high and low portions of the impulse sound. Many receivers already employ noise blankers that will do better at knocking out this sort of noise.

To shortwave listeners and hams running AM, an obvious flaw in the Radio Shack DSP design is the lack of a wider audio bandwidth selection, or perhaps a heterodyne-notch-only setting. In most cases an AM signal provides more than the 200-3000 hertz bandwidth possible through the NR and SSB modes, and under certain situations the operator needs only to take out an annoying heterodyne beat note. With the Radio Shack DSP you have to also reduce the audio fidelity to communications-quality to bring the heterodyne rejection into play.

On a postive note, the notch filter did not try to fight music—some DSP units seem to have this problem.

My experiences with the Radio Shack DSP have been favorable—I would recommend it to anyone tired of fighting a losing battle with QRM and QRN. At $79.95 (30-day money-back guarantee), it is certainly a good deal. RF

A Small Box for the NN1G QRP Transciever Kit

Operate QRP in style.

by John Pivnichny N2DCH

The NN1G QRP transciever kit from Dan's Small Parts and Kits is a great buy. Here's a plan for a "cabinet" to mount the receiver and transmitter circuit boards. A close-up view of the front panel is shown in Photo A. Note that this panel is just 2" high by 5-3/8" wide. You can get a good idea of how tiny this cabinet is from Photo B, which shows it in front of my Kenwood TS830S and next to a Vibroplex Original Deluxe mechanical keyer (bug). Although this box was built specifically for the NN1G kit, many other QRP experimenters may want to use or modify these ideas for their own designs.

The box is built from sheet aluminum and half angle stock. See your local sheet metal shop to get the front and back (2" x 5-3/8"), top and bottom (4" x 5-1/2"), and sides (2" x 4") cut to size. Most shops will cut these from scrap pieces and charge you a nominal fee. The one I go to puts the money in their coffee fund and thereby avoids writing up any paperwork, etc. If you come at a time when they're not too busy, they will often do it while you wait. Angle stock is available at the hardware store.

Making the Tuning Dial

Dan provides a nice tuning capacitor with a 6:1 vernier shaft. I mounted this centered behind the front panel. A paper dial scale* is fastened to a 1-1/2" plastic disc, which is fastened to the back part of the capacitor shaft with a locking bearing. This bearing can be made from a spare phone jack by removing the contacts and insulator, then cutting part way through the bearing, lengthwise from the front, with a coping saw blade. Now as the mounting nut is tightened, it will cause the bearing to lock onto the shaft.

You will need to cut out a 1-1/2" diameter semicircular area from the front panel to let the dial show through. I cut this by hand with a coping saw after drilling entry holes for the saw blade near the corners. Finish it off with a small file. A clear plastic window large enough to cover the opening is mounted behind the panel with two small screws (2-56 machine screws with pan head are just the right size for this rig). Before mounting it, scribe a cursor line on the plastic and fill it with black ink using a felt-tip pen.

Controls

The essential operating controls—volume, tuning, power, and T/R switch—are mounted on the front panel. I decided to use a mechanical T/R switch rather than the electronic one located on the transmitter board. This eliminates the signal loss and thereby increases the overall gain of the receiver, letting you hear the really weak ones! A miniature DPDT toggle switch transfers the antenna connection and also cuts off the power to the transmitter during receive periods to prevent keying the transmitter with no antenna load.

On the rear panel, shown in Photo C, are the power and antenna connectors, as well as 1/4" jacks for the key and phones. I used ordinary jacks rather than the miniature versions so I can use my regular key and phones without adapters.

Front and back panels are mounted to the bottom plate with 1/2" angle stock. Then the receiver and transmitter circuit boards go in vertically, one on each side of the tuning capacitor. See Photo D.

Cover

The side panels are mounted to the top plate with 1/2" angle stock. Be sure everything is lined up so the top, sides, and bottom form a "frame" around the front panel, as shown in Photo A.

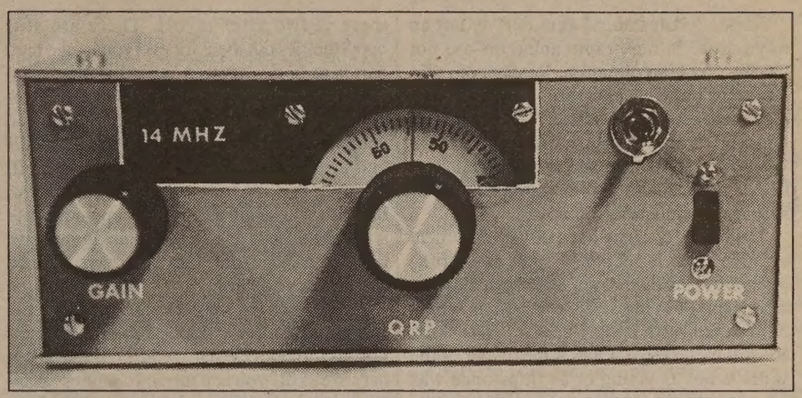

Photo A. Front panel.

In order to put the two halves of the box together, two 1" pieces of 1/2" angle stock are cut and drilled for mounting on the bottom plate, centered along each side. A single hole is drilled and tapped with a 4-40 thread in each to accept a 4-40 machine screw used to fasten the cover on.

Painting the Front Panel

You can use your imagination and creativity in personalizing the front panel. I chose to paint a black rectangle with a white border around the dial opening area. Black gives the appearance of depth compared to the remainder of the panel, which is a light blue. White dry transfer letters complete the panel. RF

*A precision drawn paper dial scale suitable for the 14 MHz version of this kit is available from the author. Send SASE plus a green stamp to 3824 Pembrooke Lane, Vestal, NY 13850.

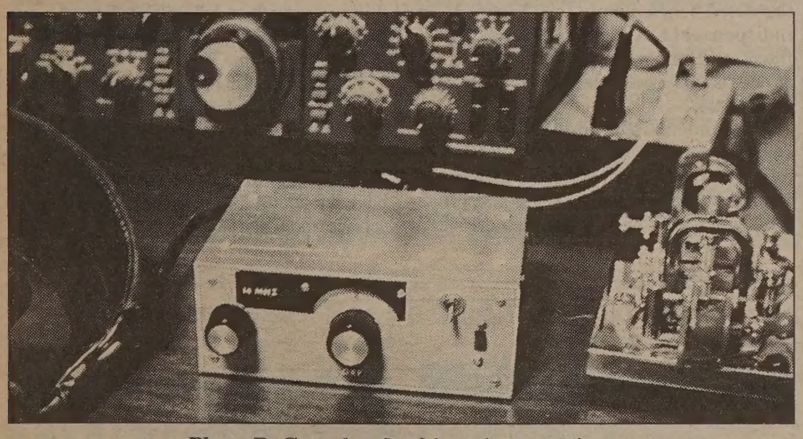

Photo B. Completed cabinet, in operation.

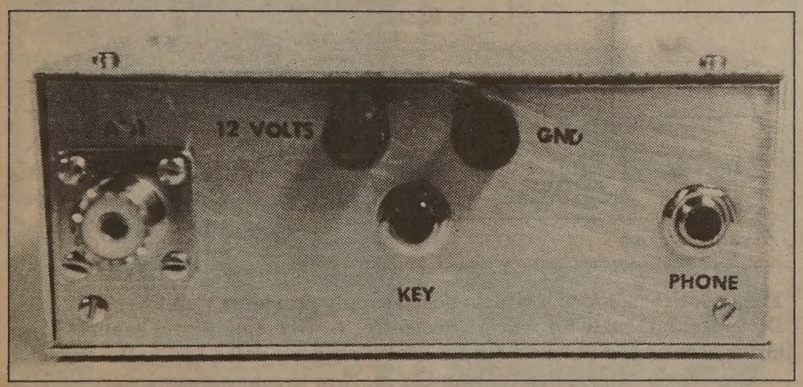

Photo C. Back panel.

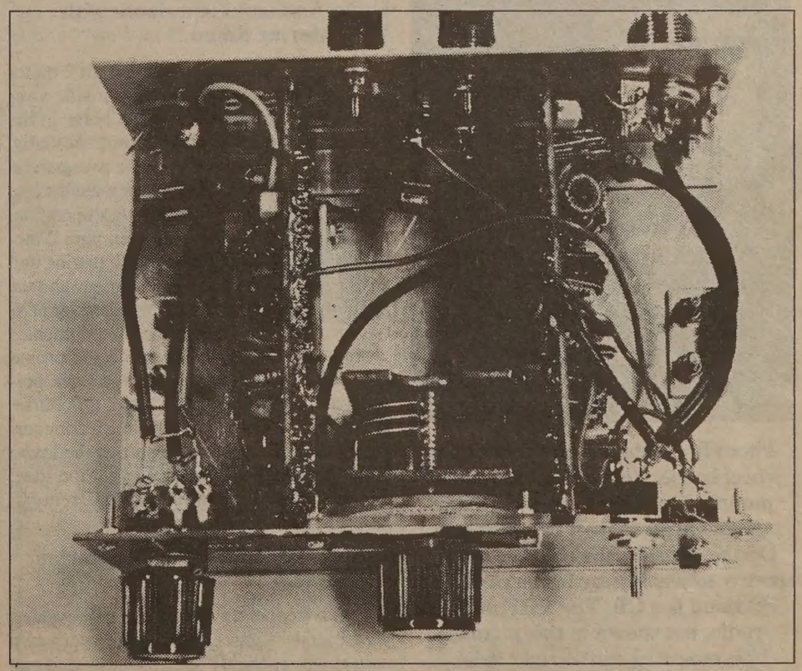

Photo D. Inside view.

Make Money as a "Professional" Amateur

Use your radio skills to survive hard economic times.

by David F. Norman

Nope, "professional amateur" is not an oxymoron. In fact, radio amateurs are not usually any kind of moron. Readers of radio amateur publications are usually well-educated, often professional in one field or another, and (like the children in Lake Wobegon) above average in intelligence. A lot of us are also either unemployed or perhaps worse, under-employed.

The more fortunate have either retirement or other outside income—such as a working spouse. Many are scratching by day-to-day despite having skills and talents which used to be worth a lot. Cheer up. The skills are still marketable. Even if the owner of the skills is not as young or as fit as once was the case, there is always something to do to turn a buck.

One man in his 50s is a case in point. After spending many years in the oil fields and beginning to bump a low six-figure income, he found himself a victim of the end of a boom in 1982. Fortunately, over the years, he had improved his electronic skills and earned a Commercial FCC license. Having kept his hand in the trade, he began to do contract marine electronics for small local shops. FCC deregulation, a general downturn of the economy, and the aggressive efforts of mail order marine suppliers took a toll again. He turned his hat around again and used his interest in hunting and shooting sports to start a small gun business.

The degree of his success is not particularly important to anyone except himself and his family; what is important to all of us is that there is life after layoff. There are still opportunities out there for everyone—the hard part is to find your own special niche.

Perhaps the place to begin is to take inventory. Don't just make a list of tools and equipment; make a detailed list of your skills and areas of expertise. Since no one will ever see this list but you, don't be modest; because you may have to back up your brags with production, don't exaggerate. If you have lived a few decades, you may have learned more than you think.

Write down the subjects you know about—formal education is important only if it gets you in the door. What we are talking about here are skills you can turn into money! Anything you ever repaired, improved, or built may be something you can do for others. If you have ever been paid as a consultant in any field, that should be underlined on your list.

If you have designed or invented something, and someone wanted one for themselves and paid you to make them one, you have a place to start. Don't forget to drag out old notes and ideas you dropped because you were too busy at something else or couldn't afford to implement the idea. New technology available makes some ideas feasible now that were simply dreams 20 years ago.

In short, take a couple of hours to take stock of your assets; there has been, and will be, plenty more time to lament your weaknesses.

Because you probably have heavy knowledge in applied electronics, this article will provide information on one way you can put this knowledge to work for profit. Remember: Most principles of business apply to all businesses. This article will discuss some of the ins and outs of the marine electronics business. Many of the business truths mentioned would apply to a small computer repair shop or TV shop as well.

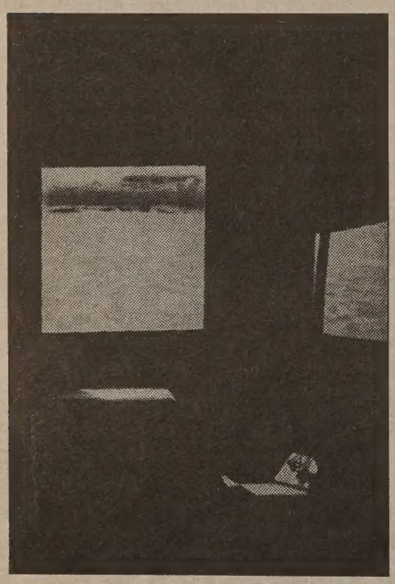

Photo B. Captain's-eye-view of the wheel house. Note the radar display mounted overhead but away from possible head contact in rough seas. On the left side, the chart recorder is easy to see. Handy to the captain's left hand is a CB. The VHF marine radio, not shown in this picture, is mounted on the right side of the wheel.

Using Amateur Experience with VHF Marine Radio

If you are heavily involved with 2 meter radio and have ever had to get inside your transceiver, you will be right at home in the guts of a Marine Band VHF unit. Actually, low-powered VHF land mobile commercial units are also related, but with somewhat less utilization of dual-channel simplex operation.

The basic differences between your 2 meter transceiver and a typical VHF marine unit are the slight differences in frequency and the tighter frequency tolerances required for FCC type acceptance of commercial equipment.

Antennas are so similar you could probably trim your 2 meter antenna to work perfectly on the VHF Marine Band. Of course, the reverse would require making a commercial antenna longer to resonate at the lower amateur frequencies. But you get the idea; there are more similarities than differences.

Setting Up Shop to Service Marine VHF Radio

If you frequently service a local repeater, your friends' transceivers, or even your own unit(s), you probably have most of what you need.

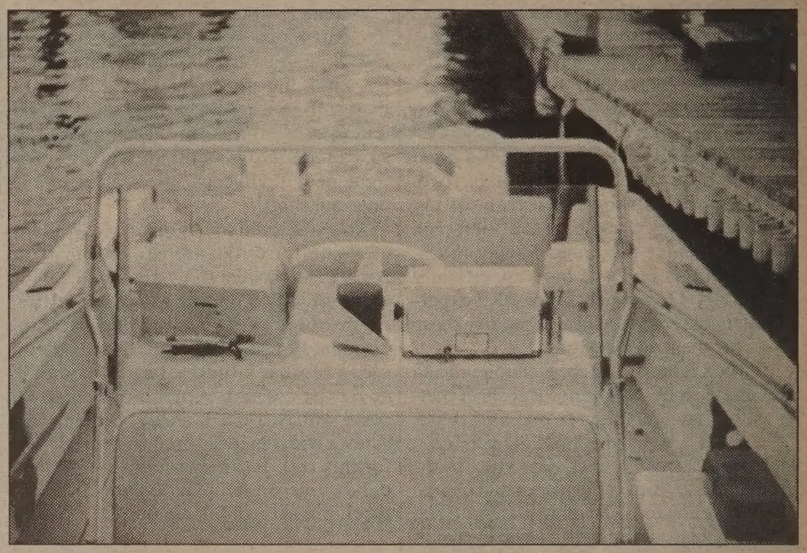

Photo A. A real honey of an open cockpit boat loaded with electronics.

An accurate—really accurate—frequency counter capable of handling VHF, and a stable—really stable—FM/AM signal generator are prerequisites. You also need a decent oscilloscope, a Bird Wattmeter (or something as accurate), a decent dummy load, and a good VHF Marine Band antenna—the higher the gain the better.

Of course, a digital voltmeter and a well-regulated bench supply (see Figure 1) are indispensable. Add a small stock of line filters, precision resistors and capacitors, fuses and marine-grade connectors, and you are in business.

If you intend to do installations as well, check to see that you have a good assortment of drill bits, decent screwdrivers and wrenches, and the other hand and power tools you would need to install a car stereo in your kid's truck.

Don't worry if you don't have everything you could possibly use. Until you have done a few installations on the types of boats common to your area, you won't know everything you will need.

One tip: When you do need tools for a job, buy the best you can afford. If you want to really tick off a boat owner, let a sorry screwdriver or wrench or dull drill bit slip and gouge his brightwork or gel coat. This is guaranteed to work every time.

The last major requirement is an FCC General Class Commercial Radiotelephone Operator's License. If you plan to expand into Radar, you will need a Ship Radar Endorsement as well. If you don't already have the license, you can still do *most* of the service and installation.

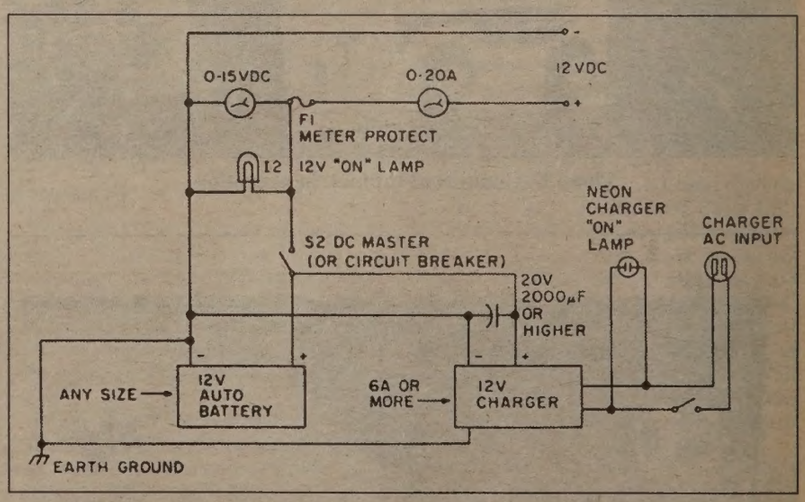

Figure 1. Schematic of a typical bench supply providing well-filtered 12 volt DC power adequate for marine electronics service. Equipment connected to this powerful supply should always have a properly rated fuse in the 12 volt + line. (From "Hams Profit From CB . . . How to set up a service center." by David F. Norman, *73 Amateur Radio*, July, 1977.)

Photo C. Small boat radar neatly installed on a commercial fishing vessel. This radar has a range of about 20 miles, greatly enhancing safety for the captain and crew.

But to be completely legal, take the time to study for the test. The written test is about on a level with the highest level amateur test. However, study guides and sample tests are available from any large bookstore or can be ordered. Prepare well for the test and don't be dismayed if you blow it the first time; you are in good company.

Just about now some of you are probably thinking: Sounds great! Only problem is that it is a hundred miles from here to the nearest decent body of water.

Not to worry. A desert can be defined as an arid area surrounded by water. No matter where you live, you will find people with boats. Some of them trailer their boats back and forth, and the others keep their vessels on the water or stored nearby. The point is you have a potential customer base wherever you happen to live.

Once upon a time, as mentioned previously, marine electronics was a pretty good field in which to work. As the business decreased, many technicians went into other fields, paradoxically leaving the field wide open to those who can and want to do the work. The reality is you probably won't get rich or even necessarily make a good living at marine electronics. But it is interesting work that does pay well when you get it and often leads to lasting friendships between the boat owner and the technician. Who can't use a fishing trip now and then?

If you didn't know better, you might also think only large boats on open water use VHF radios—not so! The small boat shown in Photo A has a lot of electronics installed. Besides CB, VHF Marine radio, and a charting depth recorder, there is a LORAN, and even an autopilot. While the owner could have afforded a larger boat, he couldn't take it with him as he could this beauty. So he simply equipped his baby with all the goodies.

Finding Customers

OK, let's assume you have a well-equipped shop and tool box, a license in your pocket, and have met local zoning and business license requirements. Now, how do you draw a crowd?

Word of mouth is always, always, the best way to get started in a new small business. Talk to your friends, the other people in your local amateur club, and about anyone else who will sit still for your pitch.

You probably already have a relationship with the nearest electronics supply house, and when he finds out you may actually spend some money with him, this relationship will improve dramatically. If he sells marine equipment, offer your services for installation and repair. He or one of his competitors may even offer you a deal on gear to sell.

Another tip: Size up the local competition carefully. Few businessmen will cut you slack on a new product if they also know you are doing the same with their competitor. You may want to look into the possibility of establishing a relationship with a factory or wholesaler. If you can get on their warranty service list, you have another potential source of income and easy access to replacement parts.

Marine supply stores and boat dealers are also excellent prospects for your services. Again, appraise the risk of competing against these established concerns as opposed to strictly contracting to them. It's your call.

If there are marinas convenient to you, call on them and speak with the Harbor Captain or his equivalent. Often marinas have restrictions on who can work on the premises. Avoid embarrassment by checking first.

So much for word of mouth. This may be all the advertising you ever need. However, if it's not enough, you still have some relatively inexpensive places to put your ad bucks. Local and nearby Yellow Pages are always a good idea. Installing a business telephone line gets you a small listing. It goes up from there. Do your research with similar types of businesses and make an informed decision as to how elaborate to get with your ad.

Other possibilities are local newspapers, free bargain shoppers (free to the reader—not the advertiser), regional boating magazines, radio, cable "rolls," and even TV. Any advertising expenditure should be planned as carefully as a backpacking trip into the wilderness; you don't need any disasters at this stage of the game.

Services to Provide

Where you go from here is up to you. A typical, fully-equipped boat (Photo B) will include a depth sounder—just audio equipment with or without video, small boat radar (Photo C)—pretty basic microwave stuff with video complications, and even entertainment equipment for boats as well as one or more two-way radios. This equipment is an opportunity for the marine electronics technician to profit from both sales and service.

Boat wiring and rewiring and insurance repairs of the complete electrical and electronics systems can further increase your gross. With a lot of hard work, and certainly some luck, you could conceivably outgrow a small shop quickly. Just take each new step as carefully as you would step onto a rolling boat.

Work Neatly and Carefully

One final tip: Speaking of stepping onto a boat, always be certain you have clean, non-marking deck shoes when working on boats. If you assume the boat owner is fussier than your most finicky aunt, you won't be far wrong.

Keep all of your work as neat as if you were rebuilding priceless antiques under the museum curator's intolerant eye. Dress, tie, and clamp any wire leads that you run neatly (Photo D), and don't even bother bringing black electrician's tape on board.

Carefully trim with marine covers any holes you put in the hull or superstructure, and just as carefully seal these holes with marine-grade silicone caulk.

Last, but not least, clean up after yourself. That means remove every single metal, wood, or Fiberglas shaving, and every tiny scrap of wire or insulation. If you don't do neat, clean work, the owner may pay you and not say a word—to you. You can rest assured your reputation will spread quickly either way. RF

Photo D. Notice the neatly dressed and clamped wires from the radar and horn.

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   getc() ;
   printf("1 khz signal activated\n") ;
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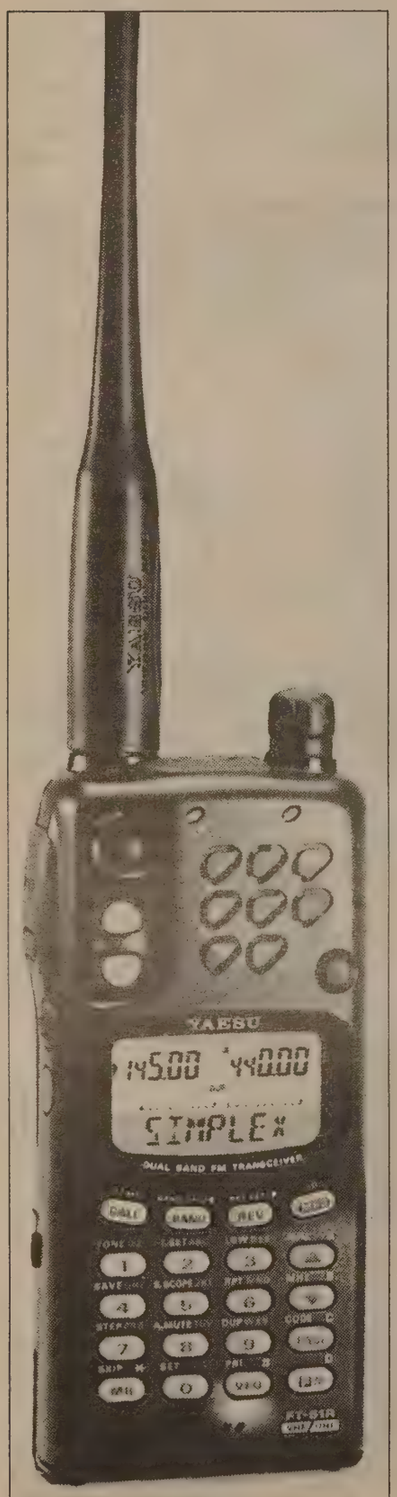
by Phil Salas AD5X



The times they are a-changin'. I remember back when I purchased my Standard SRC-146 in the early '70s I thought it was the ultimate handheld. After all, it had five or six crystal-controlled channel pairs in it! Then Icom came out with their IC-2AT. Holy Smokes! I could dial up any 2 meter frequency! Obviously, technology continues to advance at an ever-increasing rate. It seems that every year 2 meter, 3/4 meter and dual-band talkies get smaller and smaller and add more and more features. The latest dual-band (144/440 MHz) handheld from Yaesu, the FT-51R, continues this evolution to new levels of sophistication.

Features and Performance

The FT-51R is Yaesu's most recent handheld 144/440 MHz product. First of all, it is tiny! At 2-1/4" (W) x 4-3/4" (H) x 1-1/8" (D), it is, I believe, the smallest dual-band handheld available. Even with this size, however, the keypad is large enough to be easily accessed by even my relatively large fingers.

The FT-51R has a large multi-function LCD display which provides a tremendous amount of information. Besides the standard MAIN and SUBBAND frequencies, the normal display also shows volume, signal strength, channel number or alphanumeric channel name, relative transmit power, sleep-timer activity, CTSS status, and DTMF paging status. When the battery voltage gets low, a flashing battery symbol appears on the display. You can also turn on the spectrum scope feature, which displays adjacent frequency channel activity, or adjacent memory channel activity. The FT-51R even displays your battery voltage and the type of battery pack you have installed!

The 600 mAh NiCd battery pack supplied with the FT-51R gives you three power output power capabilities: 20 milliwatts, 500 milliwatts, and 1.5 watts. The 20-milliwatt output setting is great for keeping in touch with your buddies at a hamfest, and it really conserves on battery current (approximately 200 mA). The FT-51R draws approximately 1/2 amp at 1/2 watt, and 1 amp at 1-1/5 watts. With the highest power battery pack you get two more power steps of 3 and 5 watts output power. The FT-51R comes with the standard 15-hour charger; however, a quick (one-hour) charger and a mobile charger/battery eliminator are also optionally available. You can also purchase a standard or miniature speaker/microphone, and a remote-control speaker microphone. There are lots of other accessories available.

The FT-51R gives you a choice of either 70 memory channels, which can be alphanumerically named (up to eight characters), or 80 memories which are just displayed as channel numbers. You can receive two different UHF channels, two different VHF channels, or a VHF and UHF channel simultaneously. You can independently adjust the volume of the two channels you are listening to, as well as prioritize the channels so that when the priority channel is active, the secondary channel is muted.

One interesting feature provided is the CTSS scan feature, which automatically determines for you the CTSS tone in use on any incoming signal. To use this, select the frequency of interest and enable the TONE/SQUELCH mode. Next, select any CTSS tone and press the scan button. When the FT-51R finds the right CTSS tone, it stops scanning, beeps at you, and displays the tone.

> ***"Instructions scroll across the LCD display and guide you through the necessary steps!"***

Another feature I really found very useful was the CLONING feature. This all the programming of one FT-51R to be transferred to another FT-51R. You do this by turning on the two units with the function button pushed. Both units come up in the standby/clone mode. You then connect a cable from the earphone jack of one FT-51R to the earphone jack of the second FT-51R. Next, push the down-arrow on the radio to be programmed (the display shows IN), and push the up-arrow on the sending FT-51R (the display shows OUT). Programming takes about 10 seconds, after which the programmed FT-51R automatically turns off. Why would you want to do this? Well, in my case I always have to buy two of everything—one for me and one for my XYL (N5UPT). With 70 alphanumeric memories, it sure saves time in setting up both units with the same programming.

Ok, fine, it's got all the features known to mankind. But can you use it, and how does it perform? Well, Yaesu has done an excellent job of making the FT-51R very user friendly or "stupid-proof." I have a Yaesu FT-990 for my HF station and have found that I can easily use virtually all the features without having to look at the instruction book. The FT-51R also follows this philosophy. I do recommend that you read through the excellent instruction book once and do a few of the basic things called out—like saving things to memory, setting main and subband priorities, etc. However, after doing this once, you can essentially put the book away. The reason is that most of the functions are extremely logical, and Yaesu has incorporated instructions for functions that aren't self-explanatory right into the display! When

Continued on page 14

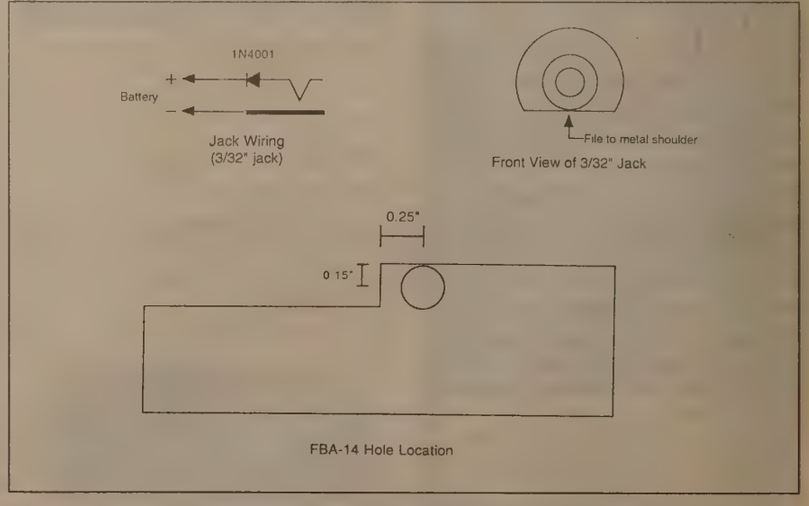


Figure 1. Jack modifications and drilling location for adding the phone jack.

Uncle Wayne's Bookshelf

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RF 6/95

Yaesu FT-51R
144/440 MHz Dual-Band Handheld

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you access a special function, the instructions scroll across the LCD display and guide you through the necessary steps! You have to experience this to really appreciate it. Also, the keypad is very well laid out and very easy to use by virtually any size fingers. From a performance standpoint, the audio quality on both transmit and receive are excellent. There's not much else to say except that I like it!

Alkaline Battery Pack Modification

Whenever I purchase a handie-talkie, I always purchase an alkaline battery pack to go with it. Alkaline batteries really last a long time and are perfect for weekend-long hamfests when you leave your unit on for hours on end. However, I like to have the flexibility of using the alkaline battery pack with rechargable NiCds, also. Unfortunately, the Yaesu FBA-14 alkaline battery pack can not be charged when it contains NiCds. The only way to charge the batteries is to remove the NiCds and charge them on an external AA NiCd charger. After a little bit of thought I was able to come up with a modification to the FBA-14 battery pack so that internal NiCds can be easily charged.

The wall transformer supplied with the FT-51R for charging has a 3/32" phone plug that plugs into the base charging stand provided. It turns out that, with a little care, you can mount a 3/32" phone jack in the FBA-14 so that it doesn't interfere with the batteries. For the phone jack, use a Radio Shack 274-292 3/32" open-frame jack. This is a closed-circuit jack. You must modify this jack by cutting off the unused terminal and filing down one side of the jack to the metal shoulder. Refer to Figure 1 for the jack modifications and the drilling location on the FBA-14 for the jack.

You will need to modify the FBA-14 pack by cutting out the plastic web in the pack where the jack mounts. I used #30 insulated wire-wrap wire to connect the jack shell to the negative internal terminal. Wire a 1N4000-type diode in series with the center pin of the jack (anode or non-banded end of the diode soldered to the jack), then use #30 wire-wrap wire to connect the cathode (banded) end of the diode to the positive FBA-14 terminal, as shown on the schematic. I used hot glue to hold the jack and wiring in place within the FBA-14 battery holder.

That's all there is to it. Now you can charge NiCds in the FBA-14 by just plugging the Yaesu wall transformer into the new jack on the FBA-14. The Yaesu wall charger charges the NiCds at a fairly constant 60 mA rate. And, of course, you can continue to use alkaline batteries in the FBA-14—just don't try to charge them! For the NiCds, I use the Radio Shack 23-149 high-capacity 850 mAh AA cells. These batteries will take about 20-24 hours to charge, since they provide over 40% more capacity than standard 600 mAh AA NiCds.

Conclusion

If you are in the market for a dual-band talkie, take a good look at the Yaesu FT-51R. It is small, well built, extremely easy to operate, and has more features than you'll probably ever need. I found nothing that I didn't like about it—certainly a first for me! RF

MFJ-971 Antenna Tuner

Continued from page 13

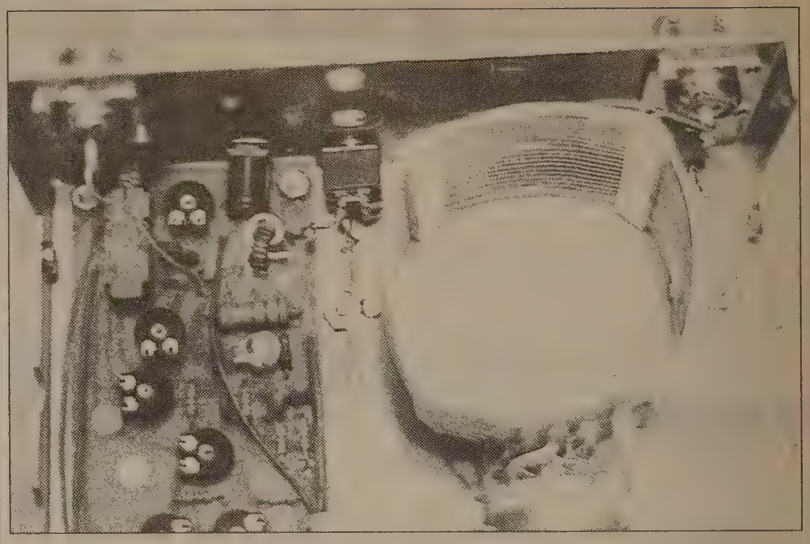


Photo C. Bypass switch, inside view.

Band	MFJ-971 30W/300W	SX-1000	MFJ-971	SX-1000	MFJ-971	SX-1000
160	10/16	10	60	50	100	100
80	10/18	10	60	50	100	100
40	10/18	10	60	50	100	100
30	10/18	10	60	50	100	100
20	10/18	10	60	50	100	100
17	9/15	10	55	50	100	100
15	9/15	10	55	50	100	100
12	8/15	10	50	50	100	100
10	8/15	10	50	50	95	100

ing on the inductor settings I picked for the match. I could find three different inductor settings that would permit me to match to 50 ohms with a 1:1 SWR. I couldn't make this measurement on 160 meters because of the problem in finding tuner settings for the match, as I described earlier.

The MFJ-971 Antenna Tuner is a great piece of equipment. Adding a bypass switch as described adds even more versatility to this compact and inexpensive unit. Would I recommend the MFJ-971? You bet! RF

A Nine Minute Timer?

by Warren H. McQueen N5GPL

There have been many articles in the various magazines with circuits for timers called "10-minute" timers, but isn't an operator really illegal if he waits until the 10 minutes are up to ID his station? Of course, the reason for calling the equipment a 10-minute timer is the FCC rule requiring the radio station to be identified every 10 minutes; but I believe the rule requires the station to be identified *at least* every 10 minutes. Here is a timer that can be set for nine minutes and left on to beep every nine minutes, or reset when the ID is made and it will beep nine minutes later. By using nine minutes or even less, a station operator has time to wait for the other operator to complete his transmission, or to find a chance to break in and ID his own station.

This timer uses one 555 timer IC for the nine minutes or less, and another 555 IC to reset the first one. My timer beeps every nine minutes and three seconds when left running continuously. It beeps after eight minutes and 55 seconds after being reset. The reset pulse evidently discharges the timing capacitor more than it is discharged by the reset button. I am using two 6-volt Polaroid camera batteries to run my timer.

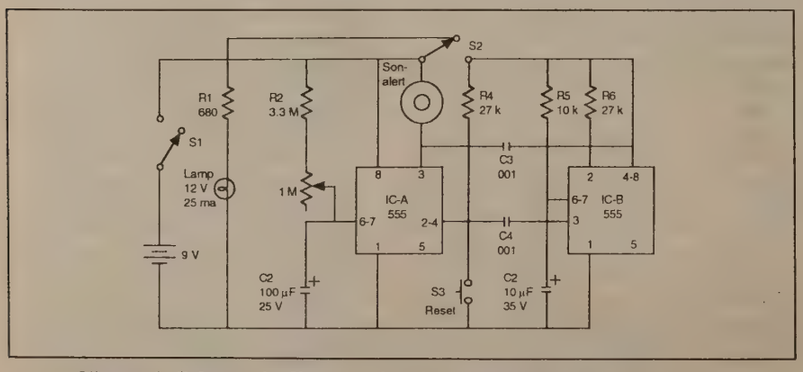
I used a 16-pin IC board with clad and a 16-pin socket already on it, and put the two 555 IC semiconductors in the same socket. It is all installed in a 2-1/2" by 5" box. If a smaller beeper and a small control potentiometer are used there will be room left over.

An easier method of assembly calls for the purchase of a prefabricated PC board. Drilled and etched PC boards are available for $4 plus $1.50 S & H per order from Far Circuits, 18N640 Field Court, Dundee, IL 60118.

I put the two small capacitors on top of the board, and the other parts on the bottom. I called the two positions of the S2 switch the "squeak" and "squeal" positions, because in the squeal position it continues to squeal until button S3 is pushed. In the squeak position it makes a short squeak and starts timing again. The light is lit continuously in the squeal position and the lamp shown only draws 9.4 mA, but it may be left out if desired.

S1, the on-off switch, is a push-on, push-off switch. S2, the mode switch, is a slide switch. S3, the reset switch, is a doorbell push-button switch. Most hams have plenty of switches that may be substituted.

Something that may not be well known about the 555 timer is that a low-voltage battery does not have much effect on the timing of the circuit. As the battery voltage gets lower the timing capacitor does not charge up as far, but it also charges up more slowly, so the overall timing is the same. Of course, the volume of the beeper will be less for a lower-voltage battery than for a full-voltage battery. I use a Sonalert unit with my timer, but Radio Shack has piezo beepers that can be used. RF



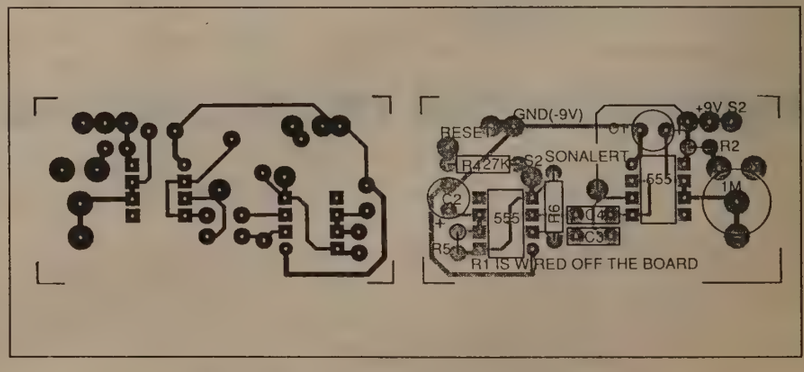


Figure 1. Schematic diagram for the Nine Minute Timer circuit.

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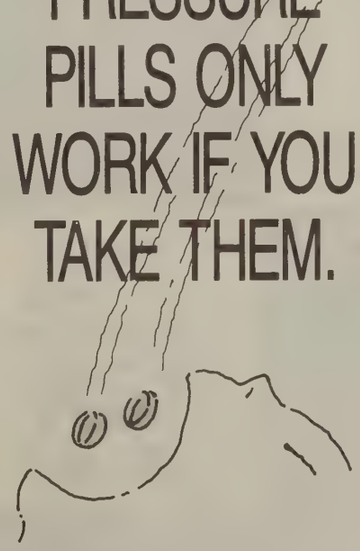

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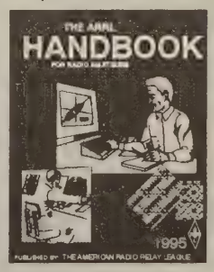

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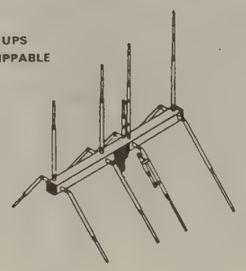

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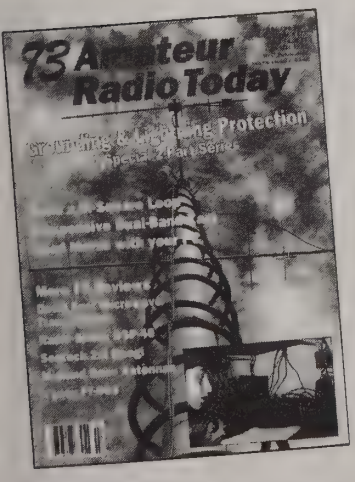

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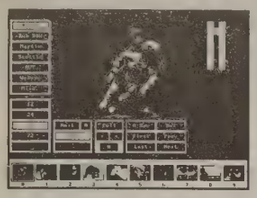

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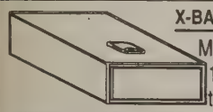

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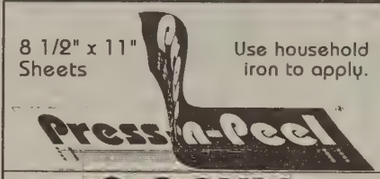

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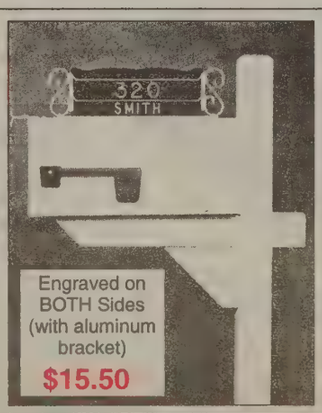

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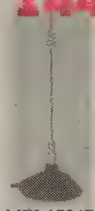

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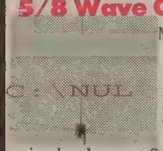

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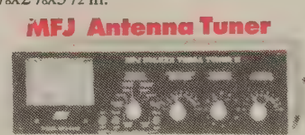

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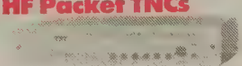

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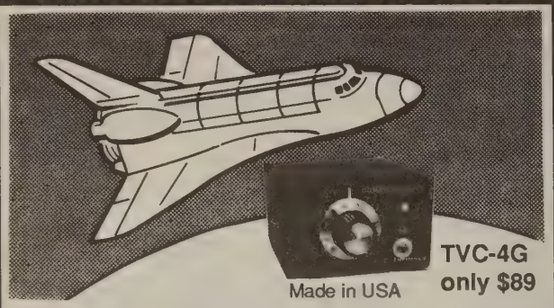

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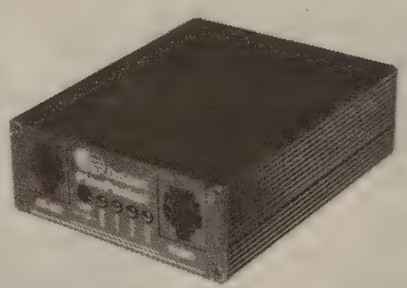

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RF vintage review

Swan's Astro 102BX Transceiver

by Tim Daniel N8RK

The best single-word description of Swan's HF transceiver, the Astro 102BX, is that it is *different*. Swan does not attempt to give you a radio that is a carbon copy of those coming from overseas. Instead, they have packed this rig with an unusual set of features, unlike those found in any other amateur transceiver, domestic or foreign.

The Astro 102BX offers solid-state no-tune-up SSB and CW operation on the 160 through 10 meter amateur bands. It is packaged in a black wrinkle finish with silver trim cabinet that is 6.4" high, 14.25" wide, and 13.75" deep, and weighs in at 23.5 pounds. Designed for both mobile and base station use, the 102BX requires a 12 to 14 VDC supply capable of providing 20 amperes. The PSU-6 serves as a matching power supply and contains an external speaker and headphone jack.

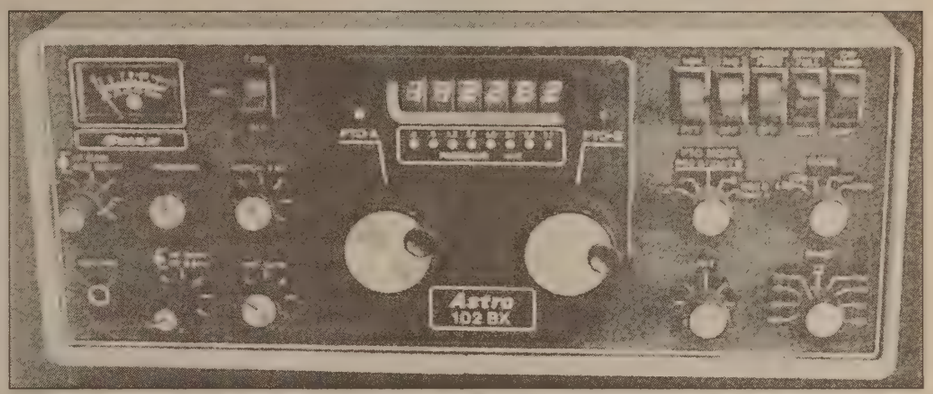

Photo A. Swan's Astro 102BX transceiver.

Receiver Versatility

One of the Astro 102BX's distinguishing features is the two permeability-tuned oscillators (PTOs), each with a large tuning knob on the front panel. This amounts to having an external VFO built right in. You can operate using either oscillator "A" or "B" exclusively, or you can select one PTO for receive and the other for transmitting. This is not a digital tuning arrangement. Frequency coverage is continuous and the digital display is based on a frequency counter. Thus, if the RIT (receiver incremental tuning) feature is used, the display will show the shift in frequency.

The PTO circuitry may be a throwback to earlier days, but the band switching uses a state-of-the-art phase-locked-loop circuit. The bandswitch acts as an address selector for a read only memory that sets a "divide by N" counter used by the PLL. With a bit of imagination and some retuning, this rig could probably be put on the new ham bands.

The Astro 102BX, in keeping with Swan tradition, uses a single conversion receiver. Eight of the 19 front panels are devoted solely to receiver functions. Included are the standard RF and AF gain controls, RIT, and a noise blanker. Among the unusual features are passband tuning, an IF gain control, continuously variable AGC decay, and an audio notch filter.

The passband tuning sets the IF bandwidth. The user can select either high- or low-pass action. Anyone who has operated on a crowded phone band will find this helpful. When someone starts a QSO 1 kHz up, all you have to do is shift the passband so that the upper portion is cut off. The resulting passband is shown by eight LEDs located below the frequency read-out. If you are a CW fan, you'll like the 300 Hz bandwidth filter that can be tuned across the 2.4 kHz IF bandwidth.

The notch filter becomes very useful when some lid decides to spend half an hour tuning without using a dummy load. Since the filter is narrow, the control must be turned slowly or you're likely to pass right over the offending signal.

Perhaps I am not enough of a receiver fanatic to appreciate the IF gain function. I found myself turning it to the maximum level and then leaving it alone. In normal operation, the IF gain and AGC decay don't need to be adjusted often. If, however, you like operating when conditions are noisy or the other station's signal doesn't fall in the normal category, then these two controls can be helpful. You need to spend some time experimenting with various combinations of settings before the Astro 102BX's flexibility becomes apparent.

Transmitter Features

The Astro 102BX, like just about any other radio worth its salt, does not need to be tuned up before you transmit. There are preset output networks for each band. If the SWR is greater then 1.7:1, the power output is automatically reduced, protecting those expensive final transistors. I found that the two MRF458 finals produced 100 watts on all bands, just as advertised. However, if you want to operate SSTV or RTTY at full power, an external fan will be needed to cool the heat sink.

Rather than providing metering for a bunch of transmitter functions as some rigs do, the 102BX has provisions to read only forward and reflected output power and the ALC voltage. It doesn't take long to gain an intuitive notion of what your SWR is by using the FWD and REFL power positions. Just keep in mind the fact that the meter reads 100 watts full scale in the forward position and 10 watts full scale when measuring reflected power.

I doubt if any ham manufacturer would produce a transceiver that did not have some kind of speech processor. Swan's Astro 102BX is no exception. when processing is selected by the front-panel switch, the microphone amplifier becomes a simple logarithmic compressor. The processor level control, along with the VOX adjustments, lies on the rig's left side, recessed behind holes in the cabinet. Since a screwdriver is needed for adjustment, these controls are less than conveniently located for operators who like to tinker with different settings.

Swan definitely kept the CW user in mind when they designed this radio. It is the only rig I have seen that has a front-panel switch allowing you to select "hard" or "soft" CW rise and decay times. Swan suggests that by using a soft waveform for slow-speed code, a more pleasing sound is produced. Similarly, selecting the hard position results in better clarity at speeds greater than 25 wpm.

The hard/soft switch might be considered a frill, but the Astro 102BX's full break-in capability can be a real asset. The unique T-R switch causes the transmitter output to be continuously connected to the antenna. In the receive mode, the transmitter appears as an open circuit. The receiver is coupled to the antenna through a transformer and reed relay. When you transmit, there are no loud relay contacts banging into place—just a soft click. This circuit allows full break-in on CW or, if you want, conventional semi-break-in is available.

Brickbats and Kudos

One unpleasant aspect of operating the 102BX is the appearance of the frequency read-out. Red LED displays are used, but no filter is placed in front of them to screen out the stray light which reflects from the unlit segments. This annoyance can be partially eliminated by looking at the display from an angle and controlling the room lighting.

The 102BX owner who uses his rig at home with an external supply and speaker is not likely to notice that the internal speaker is very small and anemic. Serious mobile operators would be well advised to use an external speaker.

An idea of the care that goes into the design and construction of a rig can be obtained by disconnecting the antenna, turning up the volume, and tuning across the bands, listening for "birdies." These mixing products are very difficult to eliminate, so every attempt should be made for them to fall away from the frequencies of interest and be at extremely low levels. When testing the Astro 102BX, we found six noticeable birdies within the amateur bands. Correspondence from Swan acknowledges the presence of these mixer products and suggests that they are below the 0.5 μV level. Our own on-the-air tests indicate that when noise levels are low, several of these heterodynes are detectable—but at a low enough amplitude to cause interference to only the weakest of signals.

Evaluating a piece of equipment as complex and expensive as the Astro 102BX can be a tough job. The evaluator has to be careful that insignificant shortcomings don't dominate the review. Every rig has its faults, but they must be weighed against the larger pool of good points.

Each Astro 102BX is shipped with a Performance Check Sheet. It gives the receiver sensitivity and power out on each band for that particular radio. Every 102BX also receives a 72-hour elevated temperature burn-in during which the rig is cycled between transmit and receive. It is comforting to know that quality control is a reality that occurs before shipping rather than in the new owner's shack.

This may be the age of appliance operating, but there are a few hams who still like to repair or modify their store-bought gear themselves. Swan has made the 102BX in such a way that this can be done with a minimum of gymnastics. Fifteen circuit boards are used, with most of the interconnections made at a distribution board. DIP-style jumpers are used, rather than plug-in cards. The documentation is excellent; there are individual one-page schematics and parts placement diagrams for each board. For once you don't have to buy an extra service manual to find out what is where.

The styling of the American-made Astro 102BX runs counter to the military-like appearance popularized by such firms as Kenwood, ICOM, and Yaesu. Features such as dual PTOs and a single conversion receiver are among Swan's symbols of an independence from the everyday world of amateur radio products. As Swan's premier transceiver, the Astro 102BX is intended for the discerning amateur, one who can appreciate its styling and versatility. RF

Reprinted from the September 1980 issue of 73 Magazine.

Fun in the Sun

by Gary D. Borich W5UDV and Robert S. Logan NZ5A

Have you ever dragged your 14-gauge wire dipole along to your favorite vacation spot, only to find that the SWR was twice what you expected? Or perhaps you brought a lightweight dipole along backpacking, only to spend hours swatting mosquitoes while pruning your antenna to achieve an acceptable SWR in your wilderness setting. QRPers take note: You don't have to use your precious vacation or recreational time making your dipole "work" in a remote setting. With these simple instructions, you can build your own lightweight antenna that not only can be easily *tuned* without cutting and splicing for minimum SWR each time you move it to a new location, but also allows you to work 40, 30, 20, and 15 meters from the *same* antenna.

Origin of an Idea

Doug DeMaw W1FB described a lightweight trap dipole in the June 1983 issue of *QST* (pp. 15-18). He told about traps and illustrated how small, inexpensive traps can be made for a multiband dipole.

We expanded on Doug's idea to create not just a lightweight trap antenna but one in which the traps could "tune away" high SWR due to changes in feedline length, soil conditions beneath the antenna, or obstructions in the near field, each time the antenna was set up, if necessary. We also wanted to build the traps so they would be permanently protected from the elements and from the knocking around they would likely receive from being constantly transported from one place to another. Figure 1 illustrates the general design of our four-band trap antenna.

What Is a Trap?

A "trap" is an electrical circuit made to resonate at a specific frequency to prevent an RF signal from passing beyond it. At a frequency other than that for which it is designed, a trap no longer acts as a trap, and the RF flows to the next section of the antenna.

Notice from Figure 1 that three traps are needed for four bands. At a transmitted frequency of, say, 21.050 MHz, a trap designed for that frequency will stop nearly all the RF from flowing beyond it. Thus, regardless of the length of the antenna, only its 15 meter portion will be in operation on that band.

As the transmitted signal changes to above or below the frequency for which the trap is designed, more of the RF flows into the next section of the antenna. Therefore, a transmitted frequency of, say, 14.050 MHz, will pass through a 15 meter trap but be blocked, or "trapped," by the 20 meter trap. Now *two* sections of the dipole are active. Since 40 meters is the final band on which we chose to operate, a trap is not necessary. Any 40 meter signal will flow through all the traps into the last section of the antenna, which, if cut to proper length, will activate all sections of the antenna. This is set by the length of the final leg and the cumulative loading effect of all the traps, which makes the entire antenna somewhat shorter than a full-size 40 meter dipole without traps.

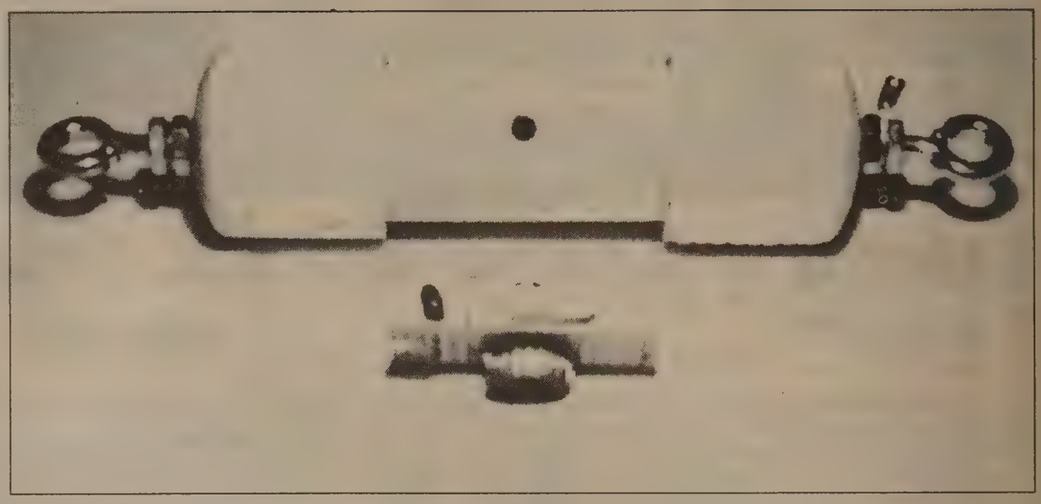

Photo A. Toroid and trimmer capacitor mounted on perf board.

What Is the Q of a Trap?

An important consideration in building traps is their "Q." Q refers to how sharply the trap will attenuate frequencies above and below that for which it is designed. If the Q of a trap is low (Q is scaled from less than 1 to into the thousands), the trap will pass a substantial amount of RF at frequencies considerably above and below its design frequency. This is another way of saying that the trap is "lossy," since it will lose or pass considerable RF to a section of the antenna that should not be active, detuning the desired section and creating higher SWR. If the Q of a trap is high, the trap will not pass substantial amounts of RF above or below its design frequency and that leg of the antenna will operate at a low SWR only at or very near the design frequency.

A very high Q would also be equally undesirable. It would prevent almost all the RF from passing to the next leg of the antenna and might so narrowly define the operating range of frequencies *within* a band that only a small portion of that band could be used with low SWR. Therefore, a happy medium must be struck, which means the Q of a trap should provide a fairly narrow bandwidth but not so narrow as to preclude using a sufficient range of frequencies within a band.

Figure 2 shows the equivalent circuit for an antenna trap. Notice that a trap is a parallel-resonant LC circuit chosen to resonate at a specific frequency. To achieve a moderate Q, the values of the capacitor and inductor are selected to yield a reactance of approximately 200 to 300 ohms.

What Is a Tunable Trap?

Figure 2 shows a "fixed" LC circuit—or fixed trap—since once the values of L and C are chosen, the frequency of the trap has been set and the Q determined. Recall that our specifications for a lightweight multiband QRP antenna called for retuning the antenna to achieve minimum SWR under changes in antenna height, obstructions in the near field, and terrain under the antenna (for example, marshy or dry earth). All these conditions can detune an antenna once its capacitance and inductance are established by traps and/or wire length.

To achieve a "tunable" trap, we placed in parallel with the fixed capacitor a variable capacitor whose range could compensate for any change in reactance that might be due to changes in feedline length, antenna height, landscape and/or terrain. In our design, we chose a variable capacitor range that could accommodate moderate changes in reactance (as when our antenna is 8 feet off the ground, tied to two Saguaro "trees" in the New Mexico desert, running alongside an RV in Big Bend National Park, or strung like a volleyball net on the beach on South Padre Island, Texas).

On the other hand, we didn't want a capacitor tuning range so large as to be overly sensitive to small changes in capacitance that might be needed. A relatively small variable capacitor in parallel with a fixed capacitor would provide the appropriate range to allow easy tuning, and since power would be distributed between capacitors, the combination would allow greater output power than a small variable capacitor alone.

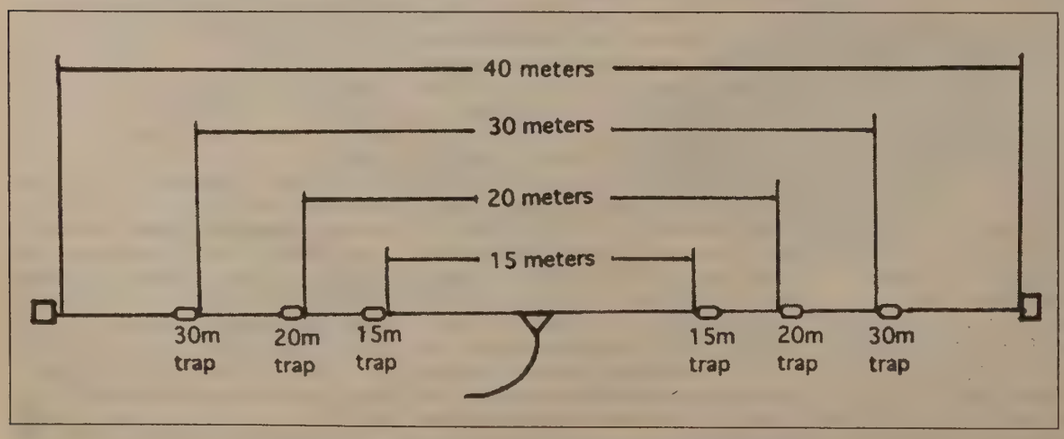

Figure 1. General design for a four-band trap dipole.

Constructing the Antenna

Our first task was to build six inductors, two for each of three bands. (Recall that we don't need a trap for 40 meters.) This had to determine the appropriate size of the inductors for 15, 20, and 30 meter traps. Using a reactance of 200 ohms to provide a moderate Q, and assuming a design frequency for our 15 meter trap about midway in the CW portion of the band, we calculated the inductance from the formula:

$$L(\mu H) = \frac{X_L}{2\pi f(MHz)}$$

which for our 15 meter frequency was:

$$1.51 = \frac{200}{6.28 \times 21.050}$$

We used T50-6 toroids, since they are stable under wide variations in temperature and are small enough (1/2" diameter) to be placed in a miniature trap enclosure. We used #24 enameled wire, and we determined the number of turns from the formula:

$$\text{Turns} = 100\sqrt{L(\mu H)/AL}$$

The *ARRL Handbook* gave us the AL factor for the T50-6 toroid, which was 40. Table 1 shows the inductances and number of turns for each trap.

Our next task was to determine the capacitance. This was determined from the formula:

$$C(\mu F) = \frac{1}{2\pi f(MHz)X_C}$$

which for our 15 meter frequency was:

$$0.000037823 = \frac{1}{6.28 \times 21.050 \times 200}$$

Since inductive reactance (X_L) and capacitive reactance (X_C) are equal at resonance, 200 ohms is used in each formula.

Our formula reports values in microfarads (μF), so we converted this value into the more practical unit of picofarads by multiplying by 1,000,000. Hence, the capacitance needed for our 15 meter trap is 37.8 picofarads. Table 1

shows the values of capacitance needed for each of our three traps. Our tunable traps would need variable capacitors that spanned each of these values in parallel with a fixed capacitor.

Our search for the "right" variable capacitor led us to study three candidates. The first was a small ceramic trimmer capacitor in the range of about 8- to 90-pF used to tune oscillator circuits. While these are small and cheap, their power limitations are so severe that our antenna would be limited to QRP operation. Next, we studied air variable capacitors. Although some air variables were in the range we wanted, they were heavy and none would fit easily into a small trap enclosure. Finally, our search led us to experiment with ceramic mica trimmer capacitors of the type used in the tank circuits of the Heath HW8 transmitter. These "butterfly" caps, as they are called, are constructed of two metal plates with a thin film of mica between them and screw down on one another. These were particularly attractive because they could handle higher power and are small (about 1/2" by 3/16"). We settled on ceramic mica "butterfly" caps which could be varied from 1.5 pF to 30 pF.[1]

Enclosing the Trap

After measuring the combined size of the wound toroid and trimmer capacitor, we determined that both would fit snugly inside a 3/4"-diameter by 2-1/2"-long section of PVC (schedule 40) plumbing pipe. To mount the inductor and cap securely inside the plastic pipe, each was placed on a 3/4" by 2" piece of perf board from Radio Shack. Use an X-acto knife to score the board, and needle-nose pliers to break it along its perforated edges. The width of the board was made slightly less than the inside diameter of the PVC so that it could be inserted snugly inside with the cap on one side and the inductor on the other, as shown in Photo A.

Holes were made through the perf board to allow the two terminal legs of the cap to protrude through to the other side. Then the two ends of the enameled wire were cleaned and soldered to the terminal legs of the trimmer capacitor. If you wish, you can remove the existing capacitor legs and solder a small-gauge wire to each end for a neater fit on the perf board. When winding the inductors, we left approximately 3" of wire at each end for connection to the capacitor and to the antenna. At this point it is important to use Q dope on the inductor to prevent the windings from moving during rough use and extreme temperatures.

To provide the additional capacitance needed for 15, 20 and 30 meters, 18-, 39- and 56-pF silver mica capacitors were placed in parallel with the trimmer capacitors for these bands, respectively. The remaining capacitance needed for resonance (see Table 1) would be provided by the trimmer capacitor.

Next, a 3/16" hole was drilled midpoint in the PVC section (shown in Photo A) so the trimmer cap could be adjusted from the outside with a small tuning tool or screwdriver. The perf board, with cap and inductor securely attached, was inserted inside the PVC section and attached with a thin layer of Super Glue at one edge to keep the trap stationary in the PVC housing.

Notice that the perf board was cut 2" long, while the section of PVC pipe was 2-1/2" long. This difference provided sufficient "play" to line up the adjustment screw in the center of the trim cap with the 3/16" hole drilled in the PVC housing. Be sure that the adjustment screw can be turned easily with a tool from outside before gluing the perf board inside the PVC housing.

Next, enclose the ends of the PVC sections containing the traps. For each trap you will need two 3/4" PVC end pieces, or "caps." These will later be glued over each end of the trap to seal it from the elements. However, before this can be done, each end must be prepared to accept the antenna wire which will connect it to the next set of traps. To make the antenna resistant to all sorts of mishaps, we decided to make each leg of the antenna easily replaceable, should a leg of the antenna break. To accomplish this, drill a 3/16" hole in the center of each end piece. Insert a 1-3/8" x 3/16" eyebolt through the hole. Attach a solder lug on the outside between two 6-32 nuts, as shown in Figure 3. Place a star washer beneath the solder lug to assure a good electrical connection.

At this point solder the ends of the 3" of #24 enamel wire left on each side of the toroid to solder lugs. These wires are soldered to their lugs *before* attaching them to the stem of the eyebolt to avoid heating the PVC. After soldering, securely fasten each lug inside each end piece with a star washer and 6-32 nut. Then, apply PVC glue to the housing and twist the end on gently with about a 180-degree turn. This will coil the wire slightly on the inside of the pipe taking up the slack and preventing it from bunching up. Now the trap should be permanently sealed in its PVC enclosure. Finally, thread a 1/4"-long x 3/16" machine bolt into the tuning hole to make the trap impervious to the elements. This bolt will self-thread into the hole and can be removed and replaced each time the trap is tuned, with no effect on the value of the capacitor inside.

Table 1 shows the length of wires that need to be cut for each leg of the antenna. We chose a relatively lightweight #18-gauge stranded wire of the type used for audio hookups (available from Radio Shack). The end of each leg is looped once through the eyebolt at the end of each trap. Since the wire legs are connected to eyebolts outside the trap to absorb the stress, a broken leg can be easily replaced by unsoldering or cutting the ends and installing a new leg, which in a field emergency could even be "wire wrapped" around the solder lug. On one version of our antenna, we soldered 0.25" female push-on connectors (available from auto parts stores) to the solder lugs on the outside of the traps, and male connectors to the ends of each of the legs of the antenna. This avoids the annoyance of antenna tangle during transport, since the traps can be "unplugged" from the wire in seconds for easy storage. Don't forget to label the traps!

Frequency (MHz)	L (µH)	C (pF)	Turns	Length of Leg (Inches)
21.050	1.51	38	19	136
14.025	2.51	57	24	30
10.100	3.15	79	28	48
7.025	——	—	—	69

Table 1. Trap specifications and wire length for a four-band dipole.

Tuning the Antenna

Install the antenna where each trap can be tuned while you stand on the ground or rooftop. Elicit the cooperation of a friend, and set up your rig and SWR meter within shouting distance of the antenna. Or, if you prefer, communicate by using handie-talkies.

Next, identify the "hot"—or inner conductor—side of the antenna at the center connector. Starting with the 15 meter trap on the hot side of the antenna, turn the screw on the trimmer capacitor slowly until the person at the rig detects a sharp dip in SWR. While tuning, hold the trap at the end away from the feed point to reduce the effect of your body on the SWR reading. You may need to go back and forth across the dip several times to be sure you've reached the lowest SWR.

Now, tune your transmitter on both sides of the design frequency, noting the changes in SWR. If your lowest SWR is *above* your design frequency, turn the trimmer capacitor slightly clockwise to move the resonant frequency of the trap down. If your lowest SWR is *below* your design frequency, turn the trimmer capacitor slightly counterclockwise to move the resonant frequency up. You will find that, once you have tuned near the dip, only the smallest possible turn will be needed to center the SWR at its lowest point. Now repeat these procedures for the 15 meter trap on the "cold" side of the antenna. The reason this side is adjusted last is that trimmer caps on the cold side of the antenna will be somewhat less sensitive, allowing you to tune the dip in SWR easily.

At the end of this adjustment the SWR should be 1.5:1 or less at the 15 meter frequency at which your transmitter is tuned. The bandwidth should be at least 200 kHz. Proceed in the same manner for the 20 and then 30 meter traps. It is not necessary that the trim caps on either side of the antenna for the same band be turned in proportional amounts. Their capacitance in combination will determine the final SWR achieved for a given band, and obstructions and proximity to the ground may differ from one side of the antenna to another.

If necessary, to adjust for minimum SWR for 40 meters, add 1/2" of wire at a time to the 40 meter legs, if your lowest SWR is above your design frequency, and remove 1/2" of wire at a time, if your lowest SWR is below your design frequency. Or, if you wish, solder a female push-on connector to the ends of the 40 meter legs and attach a 6" "pigtail" with a male connector. The pigtail can be trimmed in small amounts or removed as needed.

For the 20 and 30 meter traps, it will be important to decide where in the band you wish to operate, since their bandwidth will be smaller and SWR higher than for 15 or 40 meters. Our test antennas have nearly flat SWR for 15 and 40 meters with 200 kHz bandwidths, and 1.5:1 or less SWR for 20 and 30 meters with 100 and 80 kHz bandwidths, respectively, when our antennas were positioned as inverted vees 18 feet from the ground at the center and 10 feet from the ground at the ends.

Finally, we submitted our antenna to a power test to determine how much RF our traps could handle. Using the Oak Hills QRP Power Meter, we loaded the antenna at the design frequency on each band starting at 1 watt and increased power to 5 watts, noting any changes in SWR between these intervals. On all bands, no change in SWR was noted. Then our curiosity got the best of us, and we decided to see how "hardy" our traps would be beyond the 5-watt range. We switched to a higher range meter and increased power in 10-watt intervals to a maximum of 75 watts, but for shorter keydown times. As power was increased, SWR increased steadily, a little at the lower intervals, becoming excessive at the higher power levels, especially on the 30 meter band. Although these traps are pretty robust and ran "cool" with a full QRP gallon, we recommend you stay in the range of 5 watts.

This four-band QRP antenna is lightweight, impregnable to the elements, and can go anywhere with the lowest obtainable SWR for a given location. Its construction will give you a lifetime of use and portability for those hamming vacations, Field Days, or motel QSOs, where high SWR can diminish your fun in the sun.

Footnote:

1. Butterfly trimmer capacitors are available from Mouser Electronics (Stock No. 24PX030), 1-800-346-6873, at 85 cents each.

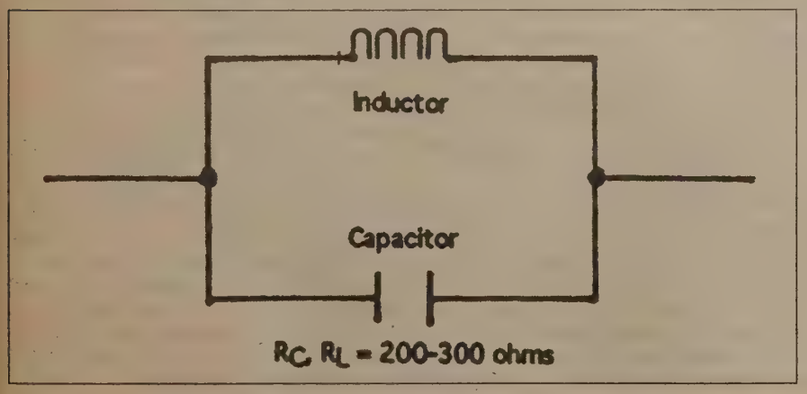

Figure 2. Electrical equivalent of an antenna trap.

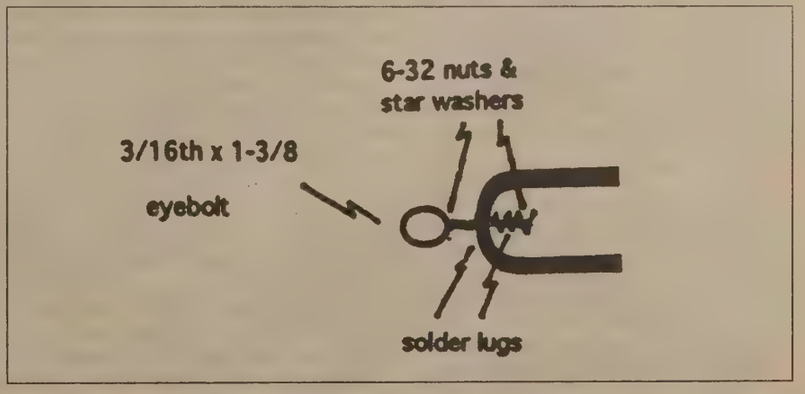

Figure 3. End piece and eyebolt assembly.

The Northern California QRP Club

by Jim Cates WA6GER

Welcome to NorCal, a group of, as of this date, some one thousand and fifty QRP enthusiasts, started in Northern California (hence the name), but quickly spreading worldwide, with members in some 40 states and a dozen countries.

NorCal was created in 1993. While its growth has been remarkable, there is no effort being made for the sake of numbers themselves; rather, our interests focus on the promotion of QRP fellowship, by means of our monthly meetings, our club quarterly, and our club projects, such as the NorCal-40 and the Sierra, and the more recent NorCal-40A.

Equality, Not Structure

Let me preface a description of our meetings by addressing the organization of the club itself. First and foremost, there are no officers or directors, nor is there any constitution or bylaws. Neither are there any dues; membership is free. That gets you on the mailing list and makes you eligible to participate in club projects. You don't have to be a member to attend meetings, but if you want to receive the quarterly, that is $5 dollars per year.

Having no officers nor structure of any significance, every member is equal to every other one. This means that, for example, if you want a QRP net, start one. No permission or approval is needed from anyone. As a member of NorCal you have the authority to start and run an official club net. Same with name badges; if you want one, have it made. Any style or color you want. It is an official club badge. Want to have a NorCal QRP contest? Organize it, but make sure you get the rules to the editor of the quarterly in time for him to publish them.

We like this lack of structure and ensuing equality. It avoids the usual club problems of personalities, politics, and factions, and at least one other pitfall of conventional club structure, tedious and boring business sessions at club meetings.

Moreover, our egos do not require that the club even continue to exist, much less, flourish. If it continues to serve a need and carries its own weight through our meetings, the quarterly, and our club projects, that is fine; if not, then it ceases to exist. Dies, as well it should.

As with any organization, however, there is a need for housekeeping. Three of us have volunteered to carry the major responsibilities. Doug Hendricks KI6DS, is editor of our quarterly, *QRPp.* Assisting him are Eric Swartz WA6HHQ, technical editor, and Mark Cronenwett KA7ULD, tidbits columnist. In addition, Steve Cates KC6TEV is awards chairman. Wayne Burdick N6KR is technical director, designer of NorCal QRP kits, and I am coordinator.

The Meetings

Our meetings are something else! Different, to say the least. We meet the first Sunday of each month at the California Burger, in Pleasanton, California, at 11 a.m. local time, which follows the Livermore Club ham swap (only a couple of miles away). This in effect gives our members a "double pinochle."

These meetings feature no speaker, and no secretary's or treasurer's reports, because we don't have any of these. Ergo: no business meeting! Instead, members bring whatever is of interest to them and therefore of interest to other QRPers—an informal show-and-tell. These items are put on various tables and members gather around, moving from table to table, asking questions, discussing, eyeballing, even making careful hands-on examinations. If something is of sufficient interest, you sit down, stay as long as you want. Get up, check out the other tables; talk to members. If you find a group of continuing interest to you, join in. Spend the entire meeting there if you want to; otherwise, mill around and see everything and meet everyone. As one member described it, our meetings are like the fun part of conventional club meetings, out in the hallway or parking lot after the formal meeting is over.

> ***"Our meetings are something else! Different, to say the least. These meetings feature no speaker, and no secretary's or treasurer's reports, because we don't have any of these. Ergo: no business meeting!"***

This goes on for at least a couple of hours, usually more, and ends when everyone is gone, often out into the parking lot, where someone has set up a QRP rig and is on the air. Hence, never a captive audience; come early if you want, stay late, whatever your time and interests permit.

Members seem satisfied with this format. But if we get tired of it, we will try something else, maybe even quit coming. Chuck the whole thing. That is our meeting philosophy as well as meeting format.

> ***"I encourage you to become a member of NorCal...We're mellow and laid-back, a super group of friendly and helpful hams, and perhaps...the last of the home-brewers?"***

QRPp

QRPp is printed four times a year, in March, June, September, and December. It is 72 pages long, and is bulk mailed 20 days prior to the issue date, to ensure timely arrival. It is sent in a sealed plastic bag to guarantee arrival in perfect condition. The more-or-less break-even cost is $5 for four issues, so that is the annual subscription rate. Canadian members pay $10, because their issues are mailed first class, and for DX, it is $15 as their issues are air mailed.

I should interject here to add that NorCal is a non-profit endeavor. If our cost estimates are low, then the deficiency is made up by the housekeepers. If there is an overage, the money is used to finance other club activities, such as our bagging machine, research and development costs for our club projects, etc.

QRPp's 72 pages are one hundred percent QRP. There are no paid ads, although we do accept messages from both commercial and individual sources, as long as they are entirely QRP related, but there are no layout-type ads. The decision of the editor as to any or all is final. He does the work; he makes the call!

Each issue is a mixture of technical and non-technical articles, ranging from the complex to the whimsical. Most are previously unpublished, but no article is reprinted without the permission of the author and publication. The articles that are reprinted are those of interest to all QRPers, recognizing that not everyone has access to all the club bulletins and club journals. Members are encouraged to submit articles and tidbits, and how-to hints. Writing skills are not essential, so don't permit any negative opinion of your writing ability to deter you from submitting an article or hint, be it on operating, building, a product review or modification—anything of QRP interest.

Individual back issues are not available, though annually we reprint the four issues, spiral bound in cardstock covers, for $15, domestic postage included. For information, write to Doug Hendricks KI6DS, 862 Frank Ave., Dos Palos CA 93620.

While on the subject of checks, permit me to add here that any check to NorCal should be made payable to Jim Cates, not to NorCal. Our club has no bank account in its own name. It's simply too much hassle, red tape and paperwork, not to mention a healthy fee. Instead, we use a separate sub-account in my name. It is free from both hassle and fees.

Club Projects

Our first club project was the NorCal-40, a small 40 meter QRP transceiver featuring a custom-designed case, silkscreened circuit board, QSK, RIT, AGC, and more. Nominal output was 2 watts. The first run of 100 kits sold in six weeks; demand was still great, so we did another hundred, and these sold in three weeks. By then we had moved on to our next club project, the Sierra, but in response to the still continuing demand, we ran a hundred partial kits.

The Sierra is another design from the genius of Wayne N6KR. It is a multiband transceiver expandable from 160 to 10 meters via plug-in modules. Modules were available for 80 through 15, with boards available for those who want to roll their own on these or other bands. We originally planned to do a run of 100 Sierra kits, but prepaid orders continued to come in; finally we cut the run at 120.

Wayne then went to work to design an SSB adapter for the Sierra, but this has been put on hold because we decided instead to do another run of NorCal-40 kits to accommodate those members who had more recently joined and wanted one of these now classic QRP rigs. They have been written up in several of the ham magazines, both here and abroad, and new and renewed interest has been generated. So, Wayne went back to his breadboard and came up with an improved version, which we dubbed the NorCal40A. It has better audio, AGC, enclosure, etc. We are doing a run of 200, and as of this date only a few are left. Most likely we will do another hundred.

Next up is the Cascade, a QRP transceiver for the 75 and 20 meter bands; it is single-sideband! Watch for the announcement in *QRPp.* After that, we anticipate doing another run of Sierra kits, inasmuch as interest and demand continues.

ARCI

A word about ARCI, Amateur Radio Club International, our national organization. We encourage everyone to join and support it. The new member dues are $12 for one year, which includes your membership certificate. Thereafter, annual dues are $10 dollars. A very professional *Quarterly* is published and is well worth the annual membership fee. To join and subscribe, make your check payable to ARCI, and mail it to Michael Bryce WB8VGE, 2225 Mayflower, N.W., Massillon, OH 44647.

Dayton

Finally, let me speak about QRP activities at Dayton. ARCI has a booth at the Hamvention center, sponsors at least two QRP forums, and has an evening hospitality room at the Days Inn South, Dayton, where 50 rooms are reserved. Each evening everyone gets together in an informal atmosphere of QRP fun and conviviality, and on Saturday evening there is a banquet, the best I have ever attended for both fun and quality of the meal.

Most of the kit manufacturers show up at the hospitality room, displaying their kits and products, and eager to answer any questions you may have. Also, the famous names in QRP are there, and they are equally gracious and helpful. It's just a whole lot of good QRP fun and fellowship. Having been there the past two years, I can attest that this is a worthwhile adventure; so much so that we are sponsoring a 1995 tour from the San Francisco area, to provide conveniences and savings for our members in the local area.

I encourage you to become a member of NorCal, an independent and unaffiliated club, one which marches to a different drummer. It's a great group of QRP enthusiasts; to me the cream of the ham fraternity, not easily frustrated, nor frantic to be at the top of the pile. We're mellow and laid-back, a super group of friendly and helpful hams, and perhaps...the last of the home-brewers?

I will be glad to answer any questions: Jim Cates WA6GER, Coordinator, 3241 Eastwood Road, Sacramento, CA 95821; (916) 487-3580. RF

the tech side

by Michael Jay Geier KB1UM

More Buttons

Last time, we were looking at the operation of a modern, microprocessor-controlled walkie talkie. Let's continue with that topic.

When we left off, we were discussing repeater offsets. Normally, you transmit on the repeater's input (receive) frequency and listen on its output (transmit) frequency. Is there ever a time when you might like to listen to the repeater's input receiver and transmit on the output? Believe it or not, yes. In particular, it can be very handy to listen to the input frequency when you want to see if you can hear another station directly, even though the other station is transmitting through the repeater. The most common use for that is to see if you're in simplex (direct, repeaterless communication) range of another station. Say you're going to a ham friend's house, and he or she is giving you directions over the repeater. For security reasons, many hams don't like to give out their exact street locations over repeaters; any thief with a scanner can listen in and know where to find some good equipment! So, as you start getting close, you and your friend may begin checking the repeater's input frequency to see if you can hear each other directly. After all, the chances of being heard on simplex by others are a great deal less than through a repeater. So, how do you go about doing this?

Most HTs have a "reverse" button which transposes the transmit and receive frequencies. If there's a good, strong signal on the input frequency, you'll hear it. If the signal is weak, pressing the "monitor" button on most walkies will temporarily open the squelch, without your having to disturb the squelch setting. Some Icoms have something slightly different. Their "monitor" button not only opens the squelch, it also reverses the frequencies, enabling you to easily check the repeater's input frequency with just one keypress. That approach has a drawback, though, because it prevents you from transmitting on the repeater's output frequency, which the normal "reverse" button lets you do. Why the heck would you want to do that?

At Close Range

Although not nearly as useful as listening to the input frequency, transmitting on the output frequency occasionally has its purposes. Let's say you and another ham are at close range, in your cars. You're both talking with friends through a repeater. Of course, to hear each other, you don't need to use the repeater, but the other friends would then be left out. But, suppose you need to tell the other ham to take a left turn at the rapidly approaching intersection, and the repeater is tied up with a long-winded monologue. What can you do? If you hit "reverse" and then start transmitting, your close-range friend's receiver will be "captured" (overridden) by your nearby, strong signal, and he'll hear you instead of the repeater, because you're on the same frequency as its transmitter. Chances are, though, nobody else will hear a thing, and you won't even interfere with other repeater users, because you're not on the repeater's input frequency and, at greater range, the repeater's transmitter will override your weak signal. It's not something you'll use every day, but it can help you out now and then.

Thanks For The ...

Memories. They're the essence of what separates the old-style radios from today's wonders. Why do we need them? Unlike CB, TV, and many commercial services, ham radio isn't "channelized" by government regulations. So, we don't have a channel 1, or 12, or whatever. That leaves us having to remember actual frequencies. Is that good? In many ways, yes, because it lets us optimize our use of the bands in ways which could be different from region to region. But, it means we have to remember a lot more. Not only do we have to remember the operating frequency, we also need to know the offset direction, offset amount (usually, but not always, 600 kHz), and perhaps a CTCSS tone frequency as well. If you only use one or two repeaters, that's not so hard. If you live near many of them, though, it can get to be a nightmare.

When memories first started appearing on HTs about 15 years ago, they held only the operating frequencies. The rest was your problem. CTCSS wasn't in amateur use then, so at least you didn't have to think about tones. But, the offset and direction were often switch-controlled. I had such a radio about 10 years ago, and I can't count the number of times I selected a new memory but forgot to change the offset switch, resulting in my calling and getting no response from the repeater.

Thankfully, that's all gone now. New radios store everything. Heck, some of them even store the output power setting in memory, so that the rig will automatically go to low power when you select the repeater down the street, thereby saving you battery power. (Personally, I don't care for that; what if you happen to be across town when you select the repeater? After all, HTs are *portable*.)

But How?

Probably no other area of walkie operation causes as much confusion as the entering and recalling of memories. Before you go thinking any snide "we Americans can't even program our VCRs" thoughts, I must complain that the memory hassle is mostly the fault of the radios' manufacturers. Software just isn't their forte, and it really shows in this area. Some of the rigs have very arcane keypress sequences. To be fair, though, some others are pretty easy to program, once you get the hang of it. No matter which radio you have, though, the basic idea is the same. Let's enter the data for a memory:

First, select your operating frequency. By that I mean the frequency on which you will *receive*, not transmit. Let's use 145.47 as an example, because it is in common use in many areas. If you're currently in memory recall mode (which lets you select from previously stored memory channels), go to VFO mode. If you're not sure how to do that, check the manual. Most rigs have a VFO button. Now, enter the frequency from the keypad. You may have to enter only the last four digits of the frequency, or you may need to enter more, depending on your radio. When the frequency is correctly entered and accepted by the rig, you should see some kind of indicator which lets you know that. On many HTs, the decimal point will come on when a frequency has been accepted. Once you've got the frequency entered, see if there's a small + or - on the display. That refers to the offset direction. If the radio has automatic offset selection, and it's turned on, the indicated direction should be correct for your chosen frequency. In the U.S.A., repeaters below 147 MHz normally have a minus offset, and those above that frequency have a plus offset. There are some exceptions, of course, but not many. If you don't see the offset indicator, you may need to set the offset using the RPT, DUP or other button dedicated to this function. Now, if there's a CTCSS tone required on the repeater, enter it using your tone set button. Although some early microprocessor HTs used odd nomenclature for the tones, newer ones show the actual tone frequency on the display. Simply turn the top-mounted dial knob until the correct frequency is displayed. Then, get back to the VFO mode in whatever way your rig requires. Usually, you just press the tone set button again. Now, you have to go to another button to set the radio to actually transmit the tone! A small T should appear on the display. At this point, you should be able to key up the repeater and test your settings. Don't forget to listen first, and always give your callsign when you key up; "kerchunkers" are not looked kindly upon by other hams *or* the FCC!

Store It

Once you know everything in the VFO is set up for proper operation, you're ready to put it all into a memory. Different HTs have various ways of selecting memory channels, but you generally have to go to memory recall mode and pick one. Doing that should not destroy your VFO settings, although you won't see them on the display because the contents of the currently selected memory will be there instead. Once you've selected an available memory, go *back* to VFO mode and then press M, MW, or whatever your radio uses to store memories. That's it. I know it sounds complicated, but it really isn't so bad once you've done it a few times. And, to use all that stuff later, all you have to do is go to memory recall mode and select the memory channel you want. All the data will instantly appear, and you can just start talking! How much easier can it get?

Well, by now you should be able to get your HT to the point where you can key up some repeaters and have a few QSOs. Next time, we'll look at more walkie functions—there are plenty more! Until then, 73 from KB1UM. RF

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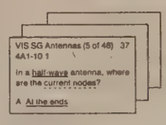

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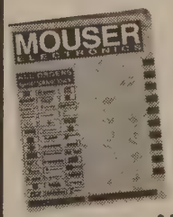

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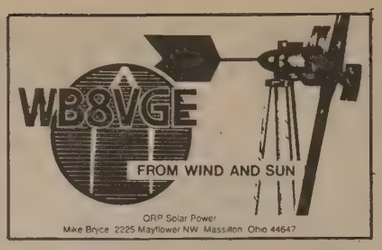

radio magic

by Michael Bryce WB8VGE

I've talked before about fixing your own equipment. But, I've never gotten around to telling you how to get the suspect part or parts off of the circuit board. This month, we'll tackle the problem.

First, I'm going to assume that you have found the defective part, and without question feel it is the cause of all your trouble. Unless you're working on an antique radio with terminal strips and solder lugs, you'll find the part mounted on a printed circuit (PC) board. To make matters more difficult, almost all of the PC boards used in today's gear are double-sided. This means there is a top foil and a bottom foil. To connect the two sides together, the holes have a micro-thin plating deposited inside. This is known in the PC board world as "plated-through holes."

When you solder a part onto a board that has plated-through holes, the solder is wicked up into the hole and onto the top of the board. This generally improves the connection without relying on the plating alone. The only trouble with this is that now you have solder on both sides of the PC board. And that makes removing a bad part rather interesting.

If you have the money, a special desoldering tool with a vacuum source will literally suck the solder out of the holes. The parts then just fall off the board. However, most of us can't afford a desoldering station, as they cost upward of $500-$1800, depending on options. (I have a home-made jobbie, but that's for another time.)

Removing a part from a double-sided PC board requires some special tools, which every ham should have in his or her shack. Here are the basic requirements. You'll need a high-wattage iron. It's best to use a 35- to 45-watt iron. Nothing less will do. The higher wattage irons produce much more heat than the small wattage irons. They are then able to melt the solder quickly on both sides of the PC board. Too much heat for too long will cause the PC board's copper traces and pads to loosen from the board material. That's something you don't want to do!

You will also need some "solder wick" or other desoldering braid. There is a special flux inside the braid, along with the copper, that causes the molten solder to wick up into the stuff.

Make a raid on your wife's sewing box and make off with a stainless steel sewing needle. These make excellent probes, as the solder will not stick to the stainless steel.

With tools in hand, it's time to get down and start yanking out parts. I hope at this stage you feel confident enough to have the suspect part identified and ready to pull. Nothing will ruin a perfectly good troubleshooting session like removing a good part. So for the sake of example, let's say we have found the problem to be an open diode. Here's how to get the guy off of the PC board while still remaining sane.

First, either cut him in half, or cut one lead as close as possible to the body of the component. You want to have as much lead left in the PC board as you can. With a needle-nose pliers, pull up the longer end of the dead component. From the bottom side of the PC board, use your soldering iron tip to remove as much solder from the pad as you can. Don't worry about getting the solder off of the top side; just work on the bottom side of the board for now.

After you have sucked up as much solder with the wick as you can, take your soldering iron and place the tip on the lead of the dead part, as close to the PC board as you can get without touching the board. Gently pull on the lead of the component, and as soon as the solder becomes liquid, yank the part out. Now, do the same with the other side of the part. Do you see now why we need the long leads? You must have something to grab onto with your pliers.

With a little luck, you'll have the diode out of the circuit board. But, there's still solder hiding in the holes. You can try and use the solder wick to suck out the holes, but I've found that it's almost impossible to get the solder out without some sort of suction. So pick up the stainless steel needle with your pliers, and place it on the center of a hole on the top side of the board. Heat the needle with the soldering iron while gently pushing down against the solder-plugged hole. Since the molten solder won't stick to the stainless, the solder will be pushed out the other side. This opens up the hole, leaving it free of solder. Do the same on the other hole. The trick in this process is the soldering iron—it must be hot, to get the job done as quickly as possible.

If you really feel bold, here is a modification to the above process. Instead of using the stainless steel needle, you can use the lead of the replacement part! You have to act fast, as the solder will grab hold of the lead in a second. It takes practice, but you can heat up the lead of the new part and push it though the board. Bend the part over and then do the same with the other lead.

ICs and transistors, on the other hand, require a bit more gore and cutting. ICs are best removed by first cutting the leads away from the chip at the chip itself. Don't clip the leads off at the board; there'd be nothing left to get a grip on! Of course this method, as you can see, destroys the IC. Really make sure you want to remove it before hacking away with the side cutters!

After the body of the IC has been cut away, pull out each and every pin. Clean the holes with the needle, and install the new part.

Transistor are done in the same way. Cut the leads off as close to the body of the transistor as possible. Pull out the leads, clean the holes and install the new part.

If you're not sure of the fix, and you don't want to install a new part on the circuit board, here is a quick service bench tip. Tack solder the part on the top side of the board to the holes before you clean them out. This way, if the replacement part does not fix the problem, you don't have to redo all the steps to insert another part. This only works with components with three or fewer leads. You can't really do this with an IC, although I've tried.

After you have installed the new part, go over the circuit board with a flux remover such as denatured alcohol. Desoldering leaves a large amount of flux on the PC board. Not only does this stuff look nasty, but may cause some problems down the road. RF

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antennas, etc.

by Joseph J. Carr K4IPV

An Antenna and a New Product

One of my favorite antennas over the years is the inverted-vee dipole. One reason why I've liked that antenna is that it performs almost as well as a half-wavelength dipole, but takes up a lot less real estate, and requires only one mounting point. This month we'll take a closer look at this old-time favorite.

First, though, we need to be certain of our terminology. The term "inverted-vee" is actually used for two different antennas. The "other" inverted-vee antenna is a kin to the multiple-wavelength longwire and rhombic antennas. That inverted-vee takes up a lot more room than a half-wavelength dipole, but provides some gain in the bargain. The "inverted-vee dipole" that we are discussing is basically a half-wavelength dipole with the center mounted to some structure, and the ends drooped towards the ground.

Figure 1 shows the schematic for the inverted-vee dipole antenna. Like the regular half-wavelength dipole, it consists of two radiator elements ("A" and "B") fed in the center by coaxial cable. Although 75-ohm coaxial cable is the standard used for this antenna for a lot of years, there may be situations where 52-ohm cable is a better impedance match. You can check it out with an antenna impedance bridge, noise bridge or other such instrument (see my *Practical Antenna Handbook—2nd Edition,* TAB/McGraw-Hill, 1-800-233-1128, or Uncle Wayne's Bookshelf). In any event, if the impedance is closer to 52 than 75 ohms, neither cable will usually result in a mismatch of monumental proportions.

The overall length of the antenna's elements (A + B) is found experimentally by cutting and trying. The usual method is to make the length about six percent longer than for a half-wavelength dipole, and then trim from there. That means that the overall length of A + B will be:

$$(A + B)_{feet} = \frac{498}{Freq_{MHz}} \quad \text{Equation 1}$$

Where: A + B is in feet, and frequency is in megahertz. For example, a half-wavelength dipole antenna cut for 7.2 MHz would be 65 feet long (overall), but for an inverted-vee dipole it would be 498/7.2 = 69.2 feet long. Each element ("A" and "B") is exactly one-half the overall length, or 32.5 feet for the standard half wavelength dipole and 34.6 feet for the inverted-vee dipole.

The ends of the radiator elements ("A" and "B") can be drooped as close as necessary to the ground, but should not contact the ground. The same kind of end insulators and rope supports as used on regular dipoles can be used to anchor the ends to the ground supports. Those ground supports can be stakes in the ground, the corner of a building, a tree, pole, fence, or whatever else would support it. The best results are ideally obtained with wooden or plastic stakes driven into the ground in such a way that the antenna is away from all other conductive objects other than the ground. But then again, if an "ideal" situation existed, you would probably have space to put up a regular dipole.

The drooped ends of the inverted-vee dipole are at a high impedance, so even moderate power levels can create high voltages at the tips of the antenna. Care for safety issues is a must! Don't install the antenna if children, guests, passersby, pets, and things that go bump in the night can be harmed by the zzzzzttt! of a high voltage RF burn (they can sue you, after all, even if they are trespassing).

Another safety warning is also in order. I know people get tired of hearing me say it, but don't *ever* install any antenna by tossing the wire elements over a power line. I know how tempting it can be when it's seemingly the only way, but the results can be fatally tragic! Every year we seem to hear one or more stories of a ham operator or SWL who was killed when he or she tossed a wire antenna element over an AC power line. *It will happen . . . this is no joke!*

Also, don't install the antenna such that a failure that brings the antenna down will cause it to contact the power lines. A broken wire, when wind-whipped, can go places you may not have thought about . . . so think about it as you plan the installation, not as you call the insurance adjuster or your lawyer.

The inverted-vee dipole should be installed with an angle of greater than 75 degrees between the elements, with angles of greater than 90 degrees being best. I know it's not always possible to do this (I've had some real acute angle inverted-vee dipoles, not from choice but from the configuration of rented real estate!), but at least try.

Once the inverted-vee dipole is installed, measure the VSWR up and down the band (some of those modern SWR analyzer instruments will do that without making a lot of QRM, by the way). If the resonant frequency, as indicated by the minimum point on the VSWR-vs-frequency curve, is lower than the desired frequency, then the antenna is too long; trim a little off each end and remeasure. Do this until the antenna is "right on," or at least as close as you can get it. Similarly, if the resonant frequency is higher than desired, then the antenna is too short; lengthen it or live with it. Unfortunately, adding a little is a bit harder than trimming some off . . . that's why Equation 1 is conservative on the "too long" side.

Length calculations for the inverted-vee dipole and a lot of other antennas can be done using the Antlers for Windows software. It is available from me at P.O. Box 1099, Falls Church, VA, 22041, for $30. I also have an operational amplifier linear IC circuit values calculator called Op-Amp Calculator for Windows for $30, and FilterMaker for Windows for $20.

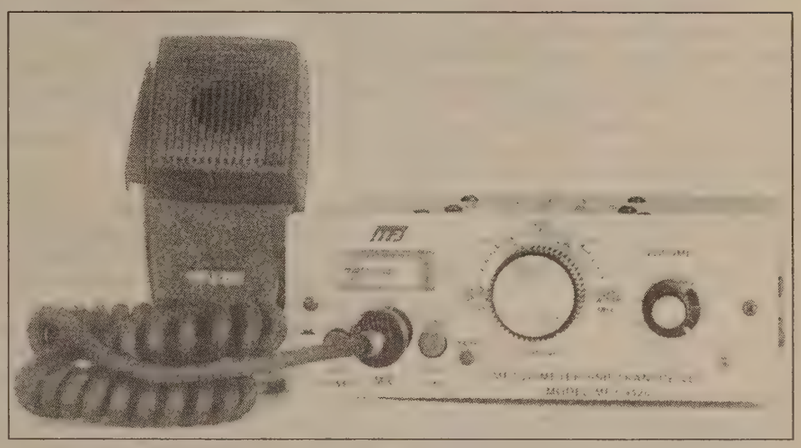


Photo A. MFJ-9420 TravelRadio 20 meter SSB transceiver.

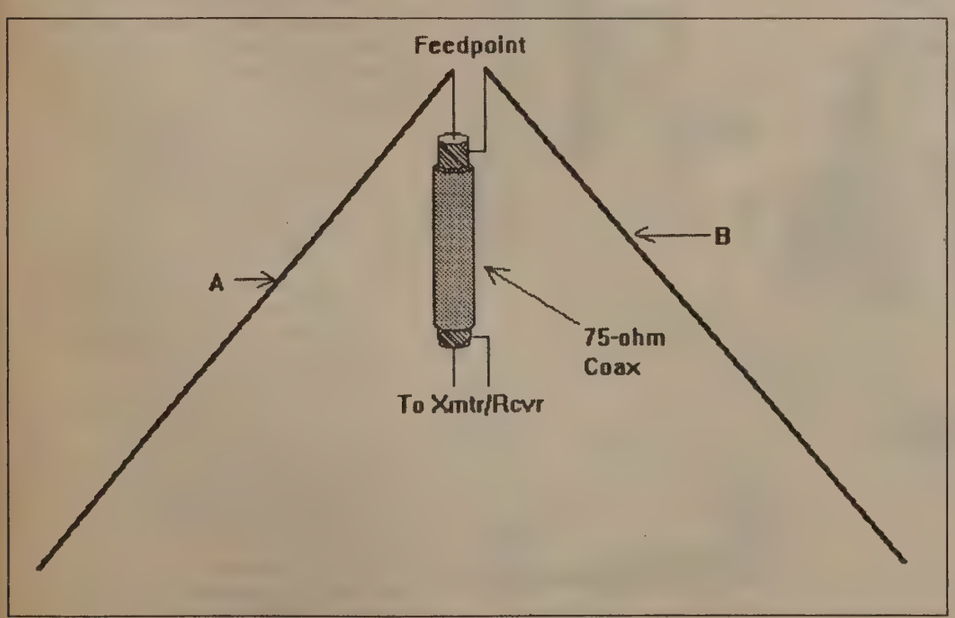


Figure 1. Inverted-vee dipole.

A New Product

Just as this column was being prepared a new product announcement arrived from MFJ Enterprises, Inc. [POB 494, Mississippi State, MS 39762; phones 601-323-5869 (voice) and 601-323-6551 (FAX)]. It is the model MFJ-9420 20 meter SSB TravelRadio (Photo A), a 20 meter SSB transceiver, which sells for $219.95. It will work from either ordinary D-cells, size-D NiCd rechargeable batteries, or a 110-volt AC wall adapter. The '9420 looks like a handy thing to drop in the luggage if you're going away for more than a day or so, and don't want to be cut off from hamming (take an antenna, by the way).

Until next month . . . 73. RF

what s next?

by Carole Perry WB2MGP

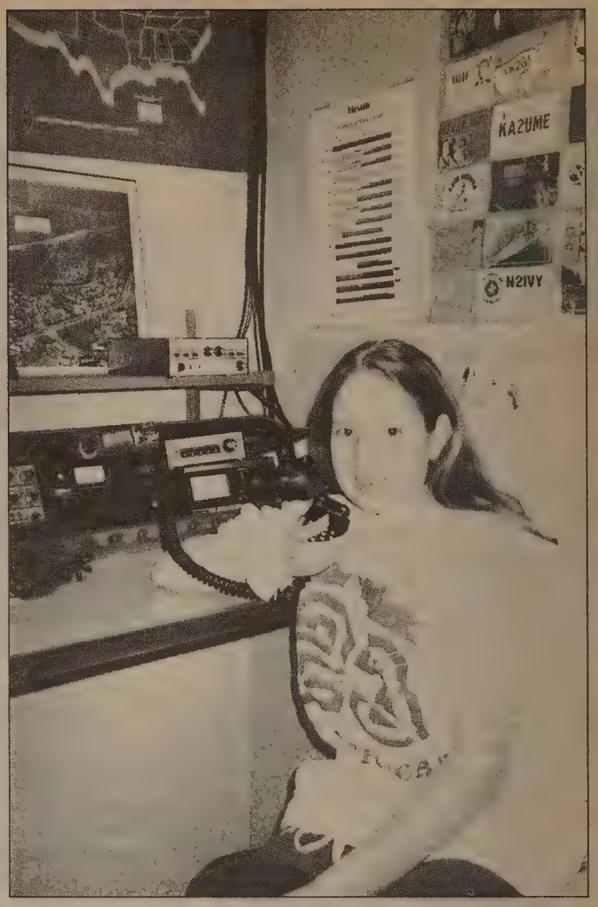


Photo A. Eighth-grader Jessica Kessler loves to speak with people from all over the world.

Ammunition for the PTA

The most important rule to remember when you are attempting to convince administrators to have a ham radio program in a school is to be prepared with a well-organized presentation. I will shortly be devoting a column specifically to help you in the upcoming fall term when you approach the principal of a school. In the meantime, if you can make use of a letter written by my principal to other school administrators, highlighting the advantages of amateur radio in a classroom, please drop me a line and I will send it right out to you.

I now propose a back-door approach which has always proven to be highly successful. The Parent Teacher Association is that hard-working group of parents in most schools across the country which helps to support all the worthwhile projects that are not well funded in the school. They are dedicated to improving the quality of life within the school for the children. Most evening meetings of these parent groups are attended by the same people. The organizations are therefore always looking for interesting and exciting speakers who can rouse some of the other folks to get out of the house to attend the meetings.

Even before you take your brilliant idea for a ham radio program to the administrators, you might choose to go this route. If you are a member of a local radio club that wants to set up the program as a club or as an after-school activity, choose the most lively speaker in the group to volunteer to do a presentation at the PTA meeting one evening. Give out lots of handouts about the value of ham radio to young people. The ARRL Education Department will be happy to supply you with the appropriate fliers and materials. Write to them well ahead of time and explain what you need the materials for.

After the culmination of a recent cultural exchange on the radio between my students and the children on the remote islands off the coast of southern Maine, a PTA mom and her daughter wrote me the following letters. Mrs. Kessler asked me to make her letter available to anybody who was interested in convincing parents of the benefits of a ham radio class in a school. I will submit for your perusal the highlights of two letters which I will be happy to send to anyone for reproduction to be given out at a demonstration for parent groups. You will find that the parent groups are very often extremely influential when it comes to presenting new ideas to the school principal. They are terrific allies to have when you finally approach the administration.

"Dear Ms. Perry:

"I am a parent of eighth-grader Jessica Kessler who is in your ham radio class at Intermediate School 72. I want to thank you for the excellent experiences you are providing the children with through the radio. My daughter is participating in something she never would have been exposed to, had it not been for the ham radio program at our school. It may only be a minor track subject for her, but since the very first day she has been very excited about this.

"I think it is wonderful that she has been in touch with so many different kinds of people, including the Navaho Indians, children in Frenchboro, Maine, astronauts, and citizens all across the United States. Jessica now corresponds with a youngster she met on the ham radio from Frenchboro, Maine. Through this letter writing and communicating on the air she has learned that people live various lives, from a one-room school house to an Indian Reservation, or by just being wheelchair-bound; it's all so different from her own daily life.

"By allowing her to talk to these people on the ham radio you have put her in contact with people who have touched her life in many ways. She has been exposed to things that, as a parent, I could never really teach her. I think this is invaluable for her growth as a human being. Learning from a book is fine, but the hands-on experience she has received in your class is something that will be with her for the rest of her life."

Mrs. Kessler's letter goes on to speak of the "worldliness" that ham radio contacts have brought into her daughter's life. Not to be outdone, Jessica sent me a letter too. The following excerpts will give other parents some insight into the benefits of a radio class as seen through the eyes of a teenager in the program:

"My name is Jessica Kessler and I am proud to say I am a student in Ms. Perry's ham class. Through her, I have been able to talk and correspond with people from all over the world, including my new friend, an eighth-grader from Frenchboro Island in Maine.

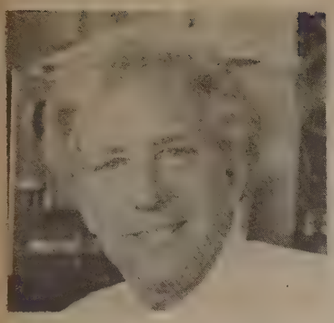
"I love walking into her room because it is always filled with excitement, whether it is talking to Brother Joe AC1U in Marrero, Louisiana, or with Gary KB7PXI at the Sun Valley Indian School in Arizona, or with Jim N4MDC in Maine; there is always somebody we all enjoy speaking with who is happy to be speaking with us in Staten Island, New York.

"It seems that every few weeks we are sending out packages to these other schools filled with stationery items, books, scrapbooks about New York City, videotapes of our school, our homes and families, and samples of different New York ethnic foods. Speaking of food—no one will ever forget when Jim sent us six live Maine lobsters, which we cooked and thoroughly enjoyed eating in school.

"So, as you can see, I enjoy just being included in everything. There is not a day when I go home where I don't mention something that we did in Ms. Perry's class. I think this is a fun, educational experience for me. I will miss the room with all the QSL cards when I graduate this June."

How can a principal or group of parents resist such poignant statements? Get in touch with me for copies: P.O. Box 131646, Staten Island, NY 10313-0006. RF

Photo B. Every few weeks we send out packages of souvenirs, videotapes of our school and families, and scrapbooks to other schools that we speak with on the air.



upgrade... don't stop now

by Gordon West WB6NOA

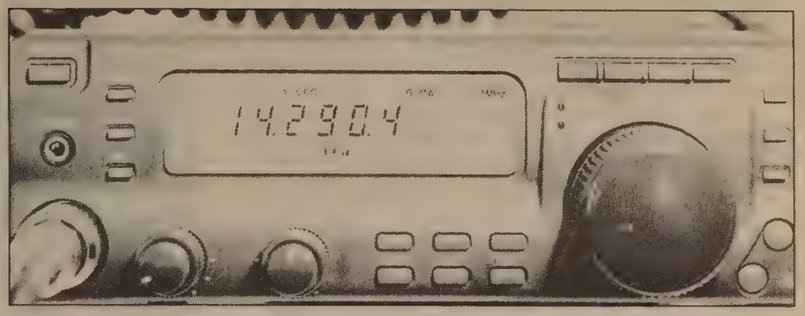


Photo A. Your HF set can be a great shortwave receiver for weather facsimile stations.

Ham Sets Tune In the Weather

Most newly licensed ham operators get started on 2 meters. But soon these operators want a taste of worldwide skip, and may ultimately purchase a high frequency transceiver to listen in on all the action. Some high frequency sets also incorporate the no-code Technician band of 6 meters, 50 MHz-54 MHz, and this allows the newcomer to see all the excitement when band conditions open up for skywave communications.

The brand-new high frequency mini-mobile SSB from Alinco also incorporates the 50 MHz band, plus general coverage. Kenwood, Icom, and Yaesu also market high frequency transceivers with general coverage receive, plus the included 6 meter band.

Finding Weather Facsimile Transmissions

Down on the worldwide frequencies between 3 MHz and 30 MHz, there is a lot more out there on the airwaves than just ham radio, shortwave broadcasting, and the WWV time ticks. Just above and below each amateur radio band are maritime allocations for ship and shore radiotelephone and radio data communications. And within this range of frequencies are specific channels for powerful shoreside weather facsimile transmissions.

These powerful weather facsimile transmissions can easily be decoded with a simple $100 computer program that will give you a weather facsimile picture just as detailed as what you might see on your evening news channel.

The following stations transmit weather facsimile signals on a daily basis:

Station Location	Callsign	Frequency in kHz; Times
British Columbia	CKN	4264.3, 6452.3, 12749.3 Continuous
Nova Scotia	CFH	4269.2, 6494.6, 10534.2, 13508.2; Continuous
Eqaluit, NWT	VFF	7706.3; Every few hours
Mobile, Alabama	WLO	6850.2, 9155.7 Continuous
Alaska	Unknown	7396.2, 10663.2; Day and evenings
Kodiak, Alaska	NOJ	4296.2, 8457.2; Various
San Francisco, CA	NNM	4344.1, 8680.1, 12728.1, 17149.3; Day and night
Boston, MA	NIK	8500.2, 12748.2; Various
Massachusetts	NMF	6348.6, 12748.2; Various
Great Lakes	WLC	5896.7; Every 4 hours
Nebraska, USA	Unknown	10574.2, 11118.2, 15679.2 Various
Norfolk, Virginia	NAM	8078.2, 9316.2, 10863.2, 15957.2, 18484.2; Continuous

What You Need

Your simple home computer, a $100 weather FAX program, and the associated program's RS-232 analog-to-digital plug, along with your shortwave HF receiver, is all you need. If you don't have a big ham set, you can easily receive these powerful signals on a portable shortwave set with SSB capabilities from Radio Shack, or the Grundig Yacht Boy available at all West Marine stores throughout the country.

The computer program will decode the twice-a-second sweeping sounds into a weather chart that will take 10 minutes to unfold before your eyes. The detail of the weather chart depends on the clarity of reception, and a simple dipole and tuning into the right station will give you outstanding success. If you can clearly hear the twice-a-second sweeping sound on your shortwave or ham set now, you know that the weather facsimile picture will come in clearly as soon as you get the weather FAX program and hook it into your home or laptop IBM PC-type computer.

What You'll Receive

Here's a sampling of what you might pick up over a one-hour broadcast:

- Full disk satellite imagery of the world
- Close-in satellite imagery of the United States
- Very close-in satellite imagery of your state or coastline
- 500 millibar jet stream analysis and prognosis
- Ocean sea state prognosis and forecast
- 48-hour weather prognosis

The software converts the sweeping tones into digital information that is decoded by your computer. Low tones will read out black, medium tones as gray, and the highest tone as white. At the beginning of satellite imagery, you will hear 10 seconds of sweeping tones that sound a little bit like a police siren yelp call, going from low to high. When your computer decodes these sounds, you will see a test pattern gray scale going from black to white on the top of the picture. If you can count eight distinct gray shades, you have an OK system with fair reception. If you count 12 shades of gray, you have a good system with good reception. If you can count up to 17 shades of gray, you have a superb system and excellent reception.

Interference to the incoming signal will look like momentary horizontal streaks across the picture. Try to identify the interference, and make sure it doesn't come on when you are receiving each 10-minute weather FAX shot.

Tune in the weather facsimile station closest to where you are located. Those of us on the West Coast look at reports from the stations in British Columbia and San Francisco. On the East Coast, Boston and Norfolk give you continuous weather charts and satellite imagery.

The Software

The weather programs are available from two manufacturers: Software Systems Consulting (615 S. El Camino Real, San Clemente, CA 92672; 714-498-5784) and AEA (2006 196th St. SW, P.O. Box 2160, Lynnwood, WA 98036; 800-432-8873). Both systems sell for around $100 "street price," and take only a few moments to install on your computer and hook into your shortwave set. I have found most recently that the AEA Weather FAX III is more easily installed by the computer illiterate (that's me!) than the SSC software, which is now Version 7 and truly designed for the computer-knowledgeable operator. Both systems produce outstanding imagery which you can print out on a laser printer, print out with fair success on a dot matrix printer or, best of all, store on the hard drive or on disk and view your weather reports right on the screen.

The AEA Weather FAX III also gives you capabilities to decode Morse code, and this lets you get in some code practice while you're waiting for the next weather schedule to begin reading out on the tube! The AEA Weather FAX III decodes Coast Guard weather NAVTEX broadcasts, too, plus amateur radio digital modes like RTTY and AMTOR.

So why not hook up some additional capabilities to your high frequency transceiver or shortwave set, and pull in the weather with your laptop or home computer? RF

Photo B. A weather facsimile picture received on a home computer and shortwave receiver.

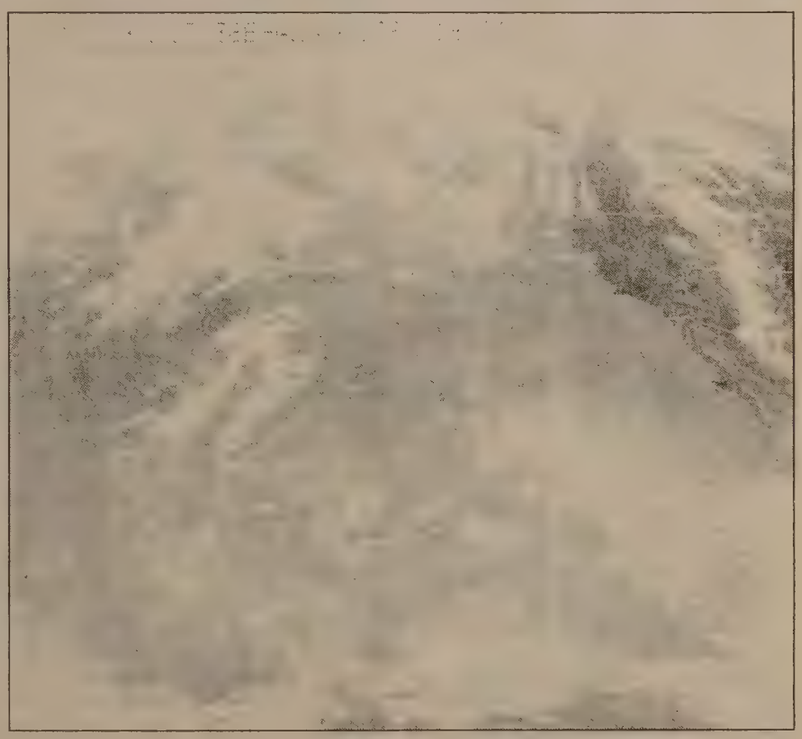


Photo C. Weather charts and satellite imagery have best definition on a computer screen. Printing out a weather FAX image will cause a slight decay in the picture's resolution.

Radio Fun flea market

Turn your old ham and computer gear into cash now. Sure, you can wait for a hamfest to try and dump it, but you know you'll get a far more realistic price if you have it out where 30,000 active ham potential buyers can see it, rather than the few hundred local hams who come by a flea market table. Check your attic, garage, cellar, and closet shelves and get cash for your ham and computer gear before it's too old to sell. You know you're not going to use it again, so why leave it for your widow to throw out? That stuff isn't getting any younger!

The *Radio Fun Flea Market* costs you peanuts (almost)—comes to 25 cents a word for individual (noncommercial) ads, and 80 cents a word for commercial ads. Don't plan on telling a long story. Use abbreviations, cram it in. But be honest. There are plenty of hams who love to fix things, so if it doesn't work, say so.

Make your list, count the words, including your call, address and phone number. Include a check or your credit card number and expiration. If you're placing a commercial ad, include an additional phone number, separate from your ad. This is a monthly magazine, not a daily newspaper, so figure a couple of months before the action starts; then be prepared. If you get too many calls, you priced it too low. If you don't get many calls, too high.

So get busy. Blow the dust off, check everything out, make sure it still works right, and maybe you can help make a ham newcomer or retired old-timer happy with that rig you're not using.

Send your ads and payment to *Radio Fun Flea Market*, Joyce Bocash, 70 Route 202 N, Peterborough NH 03458, and *get set for the phone calls.*

Personalized caps, T-shirts, mugs, mouse pads, license plates. Request free color brochure with designs. **Donovan Deily WA3B**, RD2 Box 2088A, Leesport PA 19533-9653. RF234

1995 Nationwide Hamfest List & News letter. $5 ppd. **"Hamfests '95"** Box 607, Hatboro, PA 19040. RF255

Ten-Tec Pargon 585 Near mint condition. Loaded except voiceboard, includes computer cord, scorpio software. Just back from Ten-Tec for check up and tune up. $1150 **Contact Rich** 414-877-3143. RF410

MAHLON LOOMIS, INVENTOR OF RADIO; by Thomas Appleby, (Copyright 1967). Second printing available from **JOHAN K.V. SVANHOLM,** N3RF, **SVANHOLM RESEARCH LABORATORIES,** P.O. Box 81, Washington DC 20044. Please send $25.00 donation with $5.00 for S&H. RF445

PRINTED CIRCUIT BOARDS for projects in *73, Ham Radio, QST, ARRL Handbook.* List, SASE. **FAR CIRCUITS,** 18N640 Field Ct., Dundee IL 60118. RF595

WANTED: BUY & SELL All types of Electron Tubes. Call (612)429-9397, Fax (612)429-0292. **C & N ELECTRONICS,** Harold Bramstedt, 6104 Egg Lake Road, Hugo MN 55038. RF620

FREE HAM GOSPEL TRACTS, SASE, N3FTT, 5133 Gramercy,Clifton Heights PA 19018. RF960

KPC-3 TERMINAL PROGRAM User friendly, split screen, scrollback buffer, save & send files easily. User programmable auto connect. SASE for FREE details. $29.95.**ComTreK,** Box 4101, Concord NH 03302-4101. RF999

activities calendar

Send your announcements to: Radio Fun Activities Calendar, 70 Route 202-N, Peterborough NH 03458. We'll print as many as space allows, on a "first come-first listed" basis.

ANNOUNCEMENT

SAULT STE. MARIE, ONT CANADA The Canadian Ladies ARA is pleased to announce a new certificate - Certificate #4, which is a Ten DX Contacts Certificate. Open to all YLs and OMs. All QSLs dated Jan 1, 1990 or later may be counted. For more info, please contact *CLARA Certificate Custodian, Diane Ernst VE1YL, RR#1 Maplehill Dr., Big Bras D'or, C.B., Nova Scotia, B0C 1B0.*

JUNE 4

EVANSVILLE, IN The Tri-State ARS will hold the Evansville Hamfest/Computer/Electronics Show starting at 8 AM at Vanderburgh County 4-H Fairgrounds, Hwy. 41 & Boonville-New Harmony Rd., 3 miles north of Evansville. Commercial vendor setup at 6 AM; Flea Market setup at 7 AM. VE Exams. Talk-in on 147.15 MHz (+600 kHz). Contact *Brian Esche, 2741 Shady Hollow Trail, Evansville IN 47715. Tel. (812) 473-5602 eves.*

JUNE 17

BANGOR, ME The Pine State ARC will hold the "Bangor Hamfest" 0800—1300 hrs at Herman Elementary School. Talk-in on 146.34/.94 and 146.52 simplex. There are 3 campgrounds and many motels within 5 miles of the Hamfest. Contact *Roger W. Dole, RR #2 Box 730, Bangor ME 04401; Tel. (207) 848-3846.*

DUNELLEN, NJ Raritan Valley RC "95 Hamfest" will be held at Columbia Park, 7 AM-2 PM. Talk-in on 146.625 rptr, 146.520 simplex. Contact *John Manna WA2F, (908) 722-9045,* or *Bob Pearson WB2CVL, (908) 846-2056 before 8 PM.*

LANCASTER, PA A Computer, Electronics Show, and Hamfest will be held at Centerville Jr. H.S., 865 Centerville Rd, 9 AM-2 PM, by the Red Rose Repeater Assn. Talk-in on 147.015+ and 449.575-. Vendors, contact *Mark Walton, (717) 560-2321; FAX (717) 560-2920.*

MIDLAND, MI The Midland ARC will hold their 20th annual Hamfest at the Midland Nat'l. Guard Armory 8 AM-1 PM. VE Exams. New and used amateur electronics and equipment. Talk-in on 147.00+ Midland. Contact *MARC Hamfest, P.O. Box 1049, Midland MI 48641.* Please SASE, or call *(517) 832-3053 eves. and wknds.*

JUNE 18

CAMBRIDGE, MA A Flea Market will be held 9 AM-2 PM at Albany and Main Sts., by the MIT Radio Soc. and the Harvard Wireless Club. For reservations/info, call *(617) 253-3776.* Mail advance reservations before June 5th to *W1GSL, P.O. Box 397082 MIT BR., Cambridge MA 02139-7082.* Talk-in on 146.52 and 449.725/444.725 pl 2A W1XM/R.

MUNSTER, IN The Lake County ARC will hold their 23rd Annual Dad's Day Hamfest at the Lake County Fairgrounds in Crown Point IN. Setup at 6 AM, open to the public at 8 AM. VE Exams at 9 AM. Talk-in on 147.000(+). Contact *John Gianotti KF9GW, 1513 Camellia Dr., Munster IN 46321. Tel. (219) 922-1065.*

JUNE 18-25

CERRITOS, CA Yaesu U.S.A. will sponsor "DX-Caribe Cruise '95", the second in a series of Amateur Radio theme cruises. Grid Square Itinerary: FK-42 Aruba, June 16, 17, 18; FK-53, 63, 74, 84, 85, 95 Dominica, June 19/June 20; FK-95, 94, 93 Barbados, June 21; GK-03, FK-93 Martinique, June 22. For cruise info, contact *Landry & Kling, Inc., 1390 South Dixie Highway, Suite 1207, Coral Gables FL 33146. Tel. (800) 448-9002.* Inquiries from outside the US may be directed via FAX to *Landry & Kling, (305) 661-0977.* Operations will be mobile from Dolphin Cruise Line's S.S. Ocean Breeze, and DX-pedition style from beach locations.

JULY 4

HARRISBURG, PA The Harrisburg RAC will hold a Hamfest at Bressler Picnic Grounds 8 AM-1 PM. Setup and tailgating at 6 AM. NO overnight camping. All vendors must collect PA sales tax. Talk-in on 146.76/.52. For table reservations, contact *Tom Hale WU3X, Box 418, Halifax PA 17032;* or call *(717) 232-6087* for info.

JULY 27-30

COLORADO SPRINGS, CO The Central States VHF Soc. will hold its annual conference July 27-30. Papers for inclusion in the conference proceedings, or for presentation at the conference are hereby solicited. Deadline for papers is early May, 1995. For info, please contact *Hal Bergeson W0MXY, Program Chairman, 809 East Vermijo Ave., Colorado Springs CO 80903. Tel. (719) 471-0238.*

SPECIAL EVENT STATIONS

JUNE 2-3

BATTLE CREEK, MI Southern Michigan ARS will operate W8DF June 2nd 2100Z-June 3rd 2100Z, to commemorate "Urbandale Area Homecoming." W8DF will operate CW and SSB in the lower 25 kHz of the General 10-80 meter bands, and the Novice subbands. For a Special Event Card, send QSL to *W8DF, P.O. Box 934, Battle Creek MI 49016.*

JUNE 2-4

DES ARC, AR The North Central Arkansas ARS will sponsor Station KB5DBI June 2 1800Z-June 3 0200Z, and June 3 1600Z-June 4 0200Z, to commemorate Steam Boat Days. Operation will be in the General portions of 15, 20 or 40 meters, and the Novice portion of 10 meters, if conditions permit. For a QSL, send a 9" x 12" SASE (or send $1.00 and we will provide the envelope and postage) to *NCAARS, P.O. Box 911, Judsonia AR 72081,* or to *KB5DBI at the call book address.*

HAINES FALLS, NY The Long Island Mobile ARC's Junior Operators Committee will operate N2LSK from their QRP camping weekend at North Lake Camp Grounds in Greene County. Operation will be on or near 7.040, 3.560 CW and 7.225 phone. For QSL, send SASE to *Robert Todaro N2JIX, 2218 E. 73rd St., Brooklyn NY 11234.*

NORTH OLMSTED, OH The West Park Radiops ARC will operate W8VM on Satellite and HF June 3 0000Z-June 4 1600Z, in conjunction with All Scout Weekend. Operation will take place on satellites RS-10/11, RS-12, and RS-15, as the orbits and modes permit. When satellites are not available, W8VM may be found on 3.880, 7.280, and 14.280 MHz. CW operation will be 30 kHz up into the General portion of the CW bands, and in the Novice CW bands. QSL with regular SASE for a card, or 9" x 12" envelope for a special certificate. Mail to *W8VM, 513 Kenilworth Rd., Bay Village OH 44140.*

TORONTO, CANADA The Boy Scouts of Canada, Greater Toronto Region, will operate VE3TXU from Humber West Area Competition Camp. Operation will be Sat. June 3rd, 1300 UTC-1600 UTC, 1700 UTC-2000 UTC, and 2200 UTC-0000 UTC. Frequencies: 3.840, 3.940, 7.090, 14.135, 14.290, 21.360, 28.990. For a certificate, send a 9" x 12" SASE with QSL to *VE3TXU Jim Bois, 55 Alexander St., Tottenham Ontario, Canada L0G 1W0.*

JUNE 4

PLYMOUTH, CT Radio amateurs in Plymouth will operate designated stations to celebrate the bicentennial of the Town of Plymouth. A limited number of special certificates are being made available by the Bicentennial Committee to commemorate the contact. Operation will be in the General portions of 160, 80. 40, 20, 15, and 10 meters as propagation allows. QSL with an SASE to *K1EM, P.O. Box 12, Pequabuck CT 06781 USA.* Include a shipping container large enough to hold the 9 1/4" x 13 3/4" certificate, or a No. 10 business envelope for a folded certificate; along with sufficient return postage.

JUNE 10

MT. CARMEL, IL The Radio Amateur Downstate IL Organization will operate Club Station WD9GTW 1700 UTC-2300 UTC, at the Old Time Radio Days 100th Anniversary of Meisner Radios. You will find them on the General phone subbands on 15, 20, and 40; 28490 on 10m and 146.940 Mt. Carmel Rptr. For a certificate, send SASE with QSL to *R.A.D.I.O., 827 Broadmoor, Mt. Carmel IL 62863.* For info, call *(618) 262-7111.*

MT. PLEASANT, IA The MT. Pleasant IA ARC will operate W0MME 1500Z-2200Z at the Heritage Boy Scout Camporee. Operation will be in the lower 50 kHz General class portion of the 80, 40, 20 meter phone bands. For a QSL, send SASE to *Dave Schneider WD0ENR, 1675 Old Hwy. 34, Mt. Pleasant IA 52641.* The Camporee will be sponsored by the Midwest Old Threshers and the Southeast Iowa Council of Boy Scouts.

JUNE 10-11

PIERRE, SD The Pierre ARC will operate AA0TS 1400Z June 10-0200Z June 11 from the State Capitol City, at the 66th annual South Dakota State Fire School. Phone operation will be at 3.940, 7.240, 14.240, 28.340, 145.350/.750. CW will be at 7.125. For a certificate, send QSL and a 9" x 12" SASE to *Pierre ARC, P.O. Box 1261, Pierre SD 57501.*

JUNE 11

BROOKLYN, NY The Kings County Radio Club Station, W2RAK, will operate 1300Z June 11th-0100Z June 12th in the lower portion of General 40, 20 and 15 meter phone subbands, and Novice 10 meter phone. There will be a 2 meter SSB station. For a commemorative certificate and QSL, send QSL and a 9" x 12" SASE (for flat shipment), or #10 SASE to *Robert Robinson KB2PSM, 1420 Freeport Loop Apt. 10B, Brooklyn NY 11239-2308.*

FRANKLIN, NJ The Somerset County ARS will honor Guglielmo Marconi by holding a Special Event Day at Marconi Plaza in the Somerset section of Franklin Township. Station NW2P will be on the air 1300 UTC-2100 UTC (8 AM-4 PM local). Additional stations will operate at other Marconi sites: Cape Cod, Newfoundland, and England. Voice and CW: 15m Novice, 17m and 20m General, 2m and 6m SSB, 448.175- and 146.58 simplex. For a commemorative certificate, send your QSL card and a 9" x 12" SASE to *SCARS, P.O. Box 742, Manville NJ 08835.*

JUNE 17

LAPEER, MI The Lapeer County ARC will operate KG8CL 1200Z-0000Z, to commemorate the end of WWII. The Yankee Air Force and Dupont Airport are sponsoring this event. Operation will be on the lower portions of the General phone bands. Vintage gear of the era will be used on 40 meters. QSL via *LCARA, P.O. Box 46, Hadley MI 48440.* Please enclose an SASE.

JUNE 17-18

OAK PARK, MI The Oak Park ARC will celebrate the 50th Anniversary of the incorporation of the City of Oak Park MI by operating W8MB 1600Z-2400Z June 17th and 18th. SSB freq.: 7.280, 14.280, 21.380 and 28.480 MHz. For a certificate, send QSL card with SASE to *Oak Park ARC, 14300 Oak Park Blvd., Oak Park MI 48237.*

WESTON, WV The Central ARA, in conjunction with the Stonewall Jackson Lake Sport and Water Show, will operate KC8BK 1300Z-2000Z June 17th and 18th, to commemorate the 132nd Anniversary of West Virginia becoming the 35th State. Operations will be in the lower portion of the General 80 to 15 meter phone bands, and the 10 meter Novice phone subband. For a certificate, send a 9" x 12" SASE and QSL to *C.A.R.A. - KC8BK, P.O. Box 1487, Weston WV 26452.*

JUNE 20

U.S.S. LST SHIP MEMORIAL World War II Veterens will operate K2KRF, Maritime Mobile, between Manila, Guam, Kwajalein, Hawaii and San Francisco. Operations will be in the 80 to 10 meter bands. Lt. JG John Chooljian K2KRF will be Radio Officer. For a commerative QSL, send an SASE to *QSL Manager, W2OJC, P.O. Box 2935, Clifton NJ 07015-2935.* The ship departs Taiwan June 20th, will arrive at San Francisco Aug. 17th, and New Orleans Sept. 17th.

JUNE 28

KENO, OR The Keno ARC will operate WD6EAW 1600Z-0200Z as part of the ceremonies rededicating the Crater Lake Nat'l Park Lodge. This will commemorate the 80th Anniversary of the opening of the lodge. Crater Lake is the deepest lake in the U.S. Operation will be in the lower portion of the General 80, 40, 20, 15 and 10 meter subbands. For QSL, send an SASE to *Keno ARC, P.O. Box 653, Keno OR 97627.*

JUNE 30-JULY 4

OSHKOSH, WI Members of the Winnebago ARC will operate AA9GO 1600Z-0300Z June 30—July 4, to celebrate the 24th annual Sawdust Days Festival. Operation will be on the 80 to 10 meter bands. Send QSL and SASE #10 envelope to *AA9GO, Michael O. O'Connor, 519 Franklin St., Oshkosh WI 54901.*

JULY 1

POLAND SPRINGS, ME The Androscoggin ARC will operate W1NPP from 1300Z-2200Z to commemorate the 200th Anniversary of the Town of Poland, and the 100th Anniversary of the Maine State Bldg. at Poland Springs. Operation will be in the 80 to 10, and 2 meter bands. For a commemorative QSL, send SASE to *Androscoggin ARC, P.O. Box 1, Auburn ME 04210-0001 USA.*

JULY 3-9

AUSTIN, TX Amateurs affiliated with the American Assn. for Nude Recreation, the Naturist Soc., and the Federation of Canadian Naturists, will observe the 20th Annual North American Nude Awareness Celebration by operating Special Event stations near the following frequencies: 7.265, 14.265, 21.365 and 28.465 +/- QRM. For a certificate, please send QSL and a 9" x 12" SASE to *Bob Redoutey KF5KF, P.O. Box 200812, Austin TX 78720-0812 USA.*

JULY 4

WILLIAMSBURG, VA The Williamsburg Area ARC will operate KE4YVV 1300Z-2300Z from Colonial Williamsburg, to celebrate the 219th Anniversary of the signing of the Declaration of Independence. Freq.: 28.350, 24.950, 21.350, 18.150, 14.270, 7.270 and 3.870. For an unfolded certificate, send QSL and a 9" x 12" SASE to *Hershel Kreis KE4GWV, 145 Sand Hill Rd., Williamsburg VA 23188-6609 USA.*

RF user's report

MFJ Enterprises, Inc.
P.O. Box 494
Mississippi State MS 39762
Telephone: (601) 323-5869
Orders: (800) 647-1800
Fax: (601) 323-6551
Price Class: $89.95

MFJ-971 Antenna Tuner

by Phil Salas AD5X

I'm always looking for the perfect accessories for my portable HF station. The heart of this station is a Kenwood TS-50S. I needed a small, yet full-featured, antenna tuner to complete this station. I had been looking at the MFJ-971 tuner, primarily because of its small size (2-1/2" x 6-1/2" x 6"). Christmas finally gave me an excuse to purchase one.

The MFJ-971

The MFJ-971 antenna tuner was designed to match the MFJ QRP rigs, yet it is rated at 200 watts power handling capability. After looking at the plate spacing of the transmit and antenna variable capacitors, I'm not sure I'd trust it at 200 watts. However, it does work very well at 100 watts. This antenna tuner is the typical "T-type" tuner and has the now-standard cross-needle SWR/wattmeter with switchable 30-watt/300-watt scales, or 30-watt/6-watt scales for QRP operation. You select either the 300-watt or 6-watt range with straps internal to the tuner. The dual-range switch is located on the back panel. The cross-needle SWR/wattmeter may be lighted if you connect an external 12 volts DC to a coaxial DC jack on the back panel.

I operated the MFJ-971 into a variety of random wires and a random balanced dipole (100-foot overall length) from 160 meters through 10 meters, as well as into my Butternut HF-6V vertical across the 160 and 80 meter bands. I found I could always find close to a 1:1 SWR match. The only place I had a problem was when I tried to go through the tuner into a 50-ohm load on 160 meters. I couldn't find a tuner setting that would let me do this. Overall, I was very impressed with everything about the MFJ-971.

Modifications

One thing I like my antenna tuners to have is a bypass switch for when your antenna is resonant. This is a standard feature on larger tuners. As it turns out, this feature is easy to add to the MFJ-971. For this tuner, I mounted the TUNER/BYPASS switch (a Radio Shack 275-614 miniature DPDT switch) on the rear panel where the ground stud was located. Just remove the ground screw and drill out this hole to 1/4" to pass the switch.

To wire in the switch, you will need to temporarily remove the small transformer and the balanced output jacks on the rear panel. Figures 1 and 2 detail the changes to the tuner. The actual switch wiring was accomplished by first cutting the wire that goes from the SWR board to the transmit variable capacitor. The center of one section of the DPDT switch is connected to the wire exiting the SWR board, and the switch output (I used the lower switch terminal so the tuner is in-line when the switch is up) goes to the wire attached to the transmit variable capacitor. You'll need extension wires from the switch to the ends of the cut wires.

Now unsolder the wires from the tuner's output UHF connector. Leave the wire from the output variable capacitor to the random wire output connector in place. Solder a wire from the random wire output connector to the lower switch terminal on the second switch section. Solder another wire from the UHF output connector to the center switch terminal, and, finally, solder a short wire across the two upper switch terminals. Route the wires around the inductor carefully to leave as much room as you can between the wires, the inductor, and the chassis.

Now you can re-mount the balanced wire output conectors and the output transformer. However, replace the 6-32 1-1/4" screw that holds the inductor in place with a 1-1/2"-long screw and put the slotted head of the screw on the inside of the tuner. Use #6 nuts, flat washers, and a #6 thumbscrew to turn this into a new ground post. That's all there is to it. You're finished!

More Performance Data

Now that you can bypass the tuner, there are several more things we can easily look at. First, how do all these wires in the bypassed tuner degrade the SWR of a perfect system? This is not a problem when the tuner is in-line all the time as you can adjust the tuner to compensate for the internal wiring, as well as for antenna variations. To make this measurement, I put a Diamond SX-1000 SWR/power meter between my TS-50S and the MFJ-971. At the output of the MFJ-971, I put a Radio Shack 50-ohm dummy load, which I verified at a VSWR of 1:1 up to 30 MHz. With the MFJ-971 in the "bypass" mode, I measured the following:

Band	SWR Measured
160	1.0
80	1.0
40	1.0
30	1.05
20	1.1
17	1.15
15	1.15
12	1.15
10	1.2

Not bad. You can see some effect of the internal wiring at the higher frequencies, as you might have guessed. However, this is pretty much a negligible degradation of your system's performance.

Now, how about meter accuracy? For this measurement, I put the Diamond SX-1000 at the output of the MFJ-971. I measured the meter at the three TS-50S output power levels: 10, 50, and 100 watts. The results were as follows:

Again, not bad. As you can see, you're better off using the more sensitive scale when using low power.

Finally, I measured the power loss through the tuner with the tuner in-line when matching from 50 ohms to 50 ohms. On 10 meters, I could discern no loss at all! On 80 meters, I could find losses of 0.25 dB to 1 dB, depend-

Continued on page 14

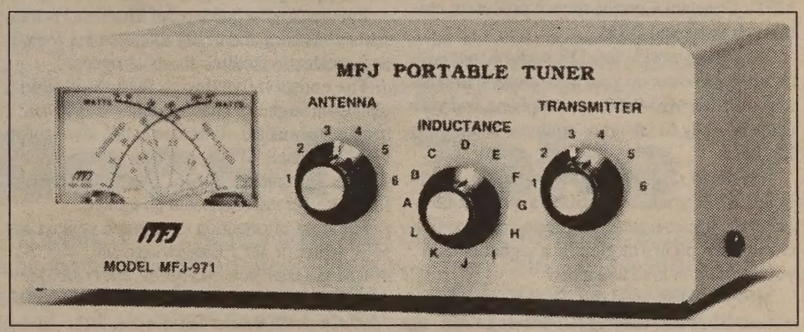


Photo A. The MFJ-971 Antenna Tuner.

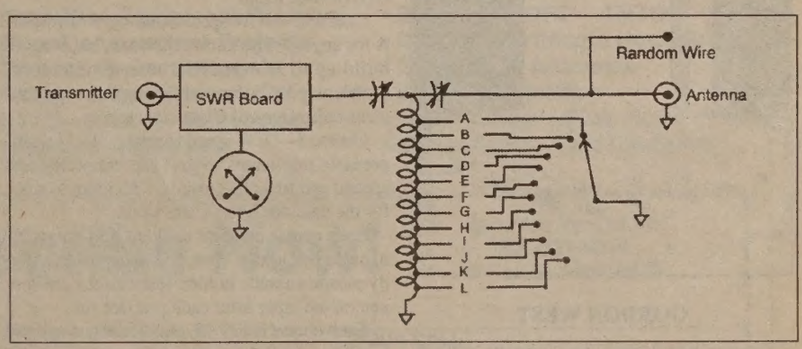


Figure 1. Original schematic (abbreviated) for the MFJ-971.

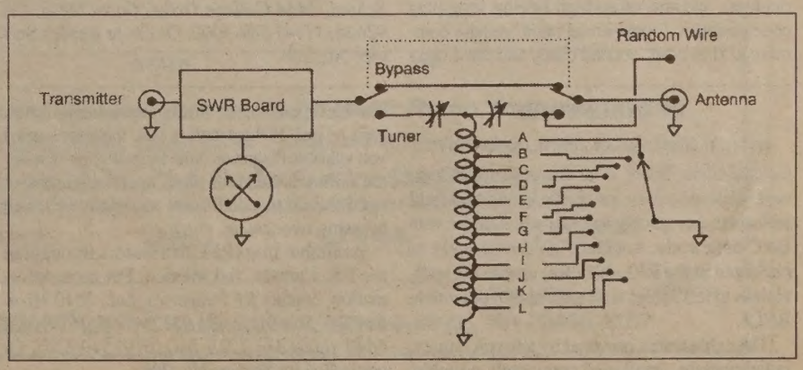


Figure 2. Schematic with the tuner/bypass switch.

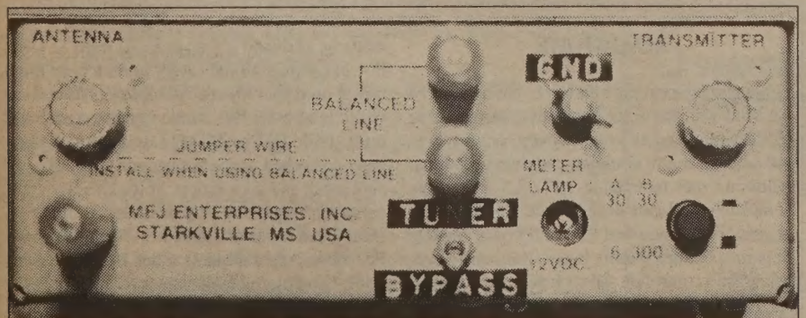
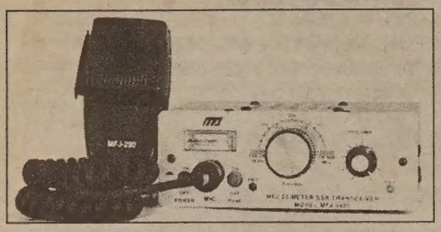


Photo B. Back panel view of the bypass switch and new ground terminal.

new products



MFJ

Turn on the MFJ-9420, 20 Meter SSB Travel Radio and you'll marvel at how well it performs for only $219.95

Weak stations roll in with surprising clarity. MFJ's Constant Current speech processor cuts through noise and QRM.

Take along world-class DX performance with exceptional power on your next vacation or business trip. The MFJ-9420, a microphone, and your antenna easily fit into your briefcase or carry-on luggage.

It features simple, portable operation, amazingly sensitive audio amplifier, a quiet, double-balanced mixer front-end, single-conversation clarity, and plenty of gain. If a signal is there, you'll pull it in loud and clear!

MFJ-9420 has a real calibrated S-meter, not a useless bargraph, making it a peaking tuner, so finding the best beam heading is clear-cut. The meter also monitors speech processing levels during transmit. No annoying synthesizer jump or obscure keypad commands to deal with. Enjoy effortless tuning with a custom-built reduction drive ball-bearing VFO capacitor.

Get big audio—powerful audio—even in heavily noise-populated locations, thanks to a special Signetics audio chip and a rugged three-inch speaker.

The 9420 transmitter was specially designed from the ground up to deliver maximum talk power from popular easy-to-carry power sources, such as NiCd, D cells, or the special MFJ-4110 wall adapter power supply.

Built to last, the bullet-proof Motorola PA transistor runs cool and easily tolerates 3:1 VSWR and accidental feedline shorts or opens.

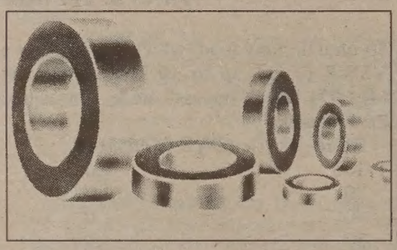
The conservative design features premium plated-through PC board, quality components, handsome brushed-aluminum panel, and a tough vinyl-clad case to ensure years of dependable service. The unit carries MFJ's "No Matter What" full one-year unconditional guarantee.

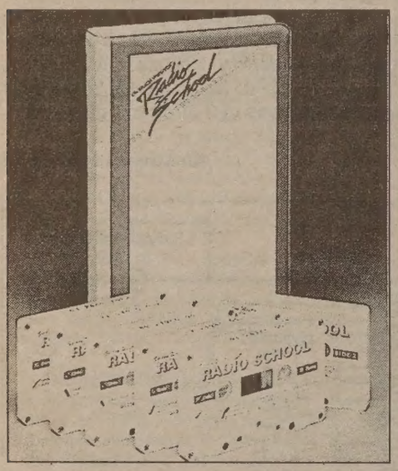
For more information or to order, contact any MFJ dealer or *MFJ Enterprises, Inc., P.O. Box 494, Mississippi State, MS 39762; (601) 323-5869, fax: (601) 323-6551, or toll-free orders (800) 647-1800.* Or circle Reader Service No. 203.

PALOMAR ENGINEERS

Palomar Engineers offers their new 1995 Toroid Core catalog. It has specifications for ferrite and iron powder cores and for ferrite beads useful to eliminate RFI. Iron powder, ferrite, and RFI kits are also described.

For a free copy, contact *Palomar Engineers, P.O. Box 462222, Escondido, CA 92029; (619) 747-3343, fax: (619) 747-3346.* Or circle Reader Service No. 204.





GORDON WEST

Gordon West Radio School instructs both amateur radio courses and as commercial radio curriculums, and now offers high-fidelity, long-play code cassettes, "commercial rated" to pass commercial first class, second class, and third class radiotelegraph licenses, as well as any level of amateur radio examination.

Radiotelegraph course 1—"Learning the International Morse Code" accelerates code character recognition with 5 wpm word rates sent with 16-20 wpm spacing. "Gordo" narrates the random runs and gives tips on preparing for any type of code exam.

Course 2—"CW speed building, 5–16 wpm" is for anyone who knows the code, but plans to build up to 16 wpm for the commercial radiotelegraph random code group test or an amateur radio General Class code test.

Course 3—"CW speed building, 10–27 wpm" prepares applicants to pass the radiotelegraph second and first class exams, with room to spare for the amateur Extra Class exam.

Each course contains six long-play cassettes, narrated by Gordon West, and packaged in a sturdy plastic cassette holder. Instructions are spoken on the tapes after each practice run.

Each course is $29.95, plus $5.00 postage and handling. Available from amateur and commercial radio dealers, or from *Gordon West Radio School, 2414 College Drive, Costa Mesa, CA 92626; (714) 549-5000.* Or circle Reader Service No. 208.

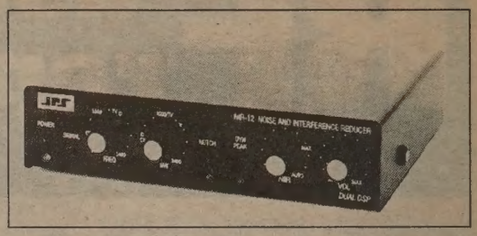
RF INDUSTRIES

RF Industries introduces the RFA-4017-1 Coaxial Cable Tester. With this convenient, low-cost cable assembly tester, the bench and field technician can quickly and easily test cables with BNC male ends. Adapters (sold separately or packaged in the RFA-4017 kit) enable the technicians to test cables with termination other than BNCs.

The cable tester, powered by a 9-volt battery, is lightweight, small, and completely portable. The LED panel of the front of the tester indicates pass or fail. If the result is fail, the panel saves you valuable diagnostic time by indicating whether the failure is due to a short, open conductor, or open shield. Installed cable can easily be tested by using two testers.

Available from RFI distributors throughout the US, Canada, and Mexico. For more information, contact *RF Industries, Ltd., 7610 Miramar Rd., San Diego, CA 92126-4202; (619) 549-6340, (800) 233-1728, fax: (619) 549-6345.* Or circle Reader Service No. 205.

JPS COMMUNICATIONS



JPS Communications, Inc., announces the most advanced DSP noise reduction and filter unit available to Amateurs and SWLs: the NIR-12 Noise & Interference Reducer and Filter Unit. The unit is a state-of-the-art audio signal processor designed to provide the user with maximum flexibility to reduce or eliminate most types of interference from received voice, CW, and data transmissions. *Dual* Digital Signal Processors (DSP) provide *simultaneous* bandpass operation, noise reduction, and multiple tone removal. The Spectral NOTCH filter eliminates multiple tone interference from "tune-ups," foreign broadcast carriers, CW, RTTY, etc. A multilayer printed circuit board provides superior shielding to virtually eliminate radiation from the DSP data bus. Two methods of noise reduction are provided: Improved Spectral Subtraction (NIR^R) and Improved Dynamic Peaking, to give the operator the best audio noise reduction possible.

For experimenters, access to the dual DSPs is provided via RS-232 on and internal header. The manual supplied with the unit describes this implementation.

The Improved NIR^R mode of noise reduction automatically enhances voice, CW, or data signals by recognizing the speech, CW, or data and reducing the amplitude of all signals which are not part of the desired information. In addition to providing a continuously variable processing level, the NIR^R control features an AUTO position to give the optimum noise reduction based on the measured signal-to-noise ratio.

The Improved Dynamic Peaking noise reduction features an external PEAK FACTOR switch to allow the operator to control the "aggressiveness" of the PEAK mode. When this mode is used in conjunction with the NIR^R mode, exceptional noise reduction can be attained without damaging speech components or intelligibility.

All modes in the NIR-12, except NIR^R mode, operate in "real time" with very small delay, so the unit may be used in *all* data modes, including ARQ modes popular with AMTOR and PACTOR. The Finite Impulse Response (FIR) filters provided in the unit have very steep skirt selectivity, linear phase in the passband, and minimum passband ripple, all desirable characteristics for good data and SSTV reproduction. The bandwidth of the filter is variable from 50 Hz to 3200 Hz, and the center frequency of the chosen filter is variable from 200 to 3400 Hz. The combination of variable filter bandwidth and variable center frequency provides exceptional "user-friendly" operation.

Installation is quite simple: The unit gets its audio input from the receiver speaker output, line output, or headphone jack, then provides volume-adjustable processed audio from its own built-in amplifier to power an external speaker of 3 to 8 ohm impedance. A line output, unaffected by the volume control, is provided for modem or phone patch.

The NIR-12 requires 12 VDC @ 1 A peak. Power adapters are available from JPS at nominal cost. Mating connectors are supplied with each unit. The unit has a one-year factory warranty and is fully upgradable.

For more information or a data sheet, contact: *JPS Communications, Inc., P.O. Box 97757, Raleigh, NC 27624; (919) 790-1011, fax: (919) 790-1456.* Or circle Reader Service No. 202.

OLD WEST GRAPHICS

Old West Graphics announces affordable custom graphic decals to amateur radio enthusiasts and other radio dx activity groups. Radio clubs and associations can order decal products for their membership.

Computers have made it possible for even small clubs to have professionally designed logos for window decals, t-shirts, sweatshirts, club banners, or whatever. Old West Graphics can take your club logo and professionally reproduce it in lots of one to one thousand. If you haven't got a club logo yet, Old West can help you design one.

Also available to radio enthusiasts: computer-cut lettering, convention/hamfest banners, shocards, amateur radio license plates, and novelty streets signs for personal driveways. For a free information packet, contact: *Old West Graphics, 749 S. Lemay, Ste. A3-355, Ft. Collins, CO 80524-3251; (800) 579-0959.* Or circle Reader Service No. 206.

MAGGIORE

Maggiore Electronic Laboratory has announced the Model R1 Repeater line with a starting price of $589.00. Used as a main system or a backup, the units start as a complete receiver and transmitter in a rack mountable, 19" x 3.5" x 9" deep, completely enclosed steel cabinet, with DC power cord, panel mounted fuse and power switch. Separate compartments house transmitter, receiver, and controller. All repeaters are designed for 100% duty cycle at -20° to +60° C and are available in power outputs from 5 watts to 35 watts in VHF and 2.5 watts to 20 watts in UHF. Power outputs adjust easily in matching high-power amplifier inputs. All repeaters now come with the new Hi Pro Studio Quality Audio and ultra stable Hi Pro TCXO Oscillators. A computer controlled, voice synthesized CAT-300 with auto patch and auto dialers, voice messages, and controller inputs and outputs is also available installed. All repeaters include a 2-year warranty. For more information, contact *Maggiore Electronic Laboratory, 600 Westtown Rd., West Chester, PA 19382; (610) 436-6051, fax: (610) 436-6268.* Or circle Reader Service No. 201.

What You Missed in 73 Amateur Radio Today

If you don't read the June issue of *73 Amateur Radio Today,* here is some of what you're missing:

• This ain't no ordinary, run of the mill keyer. Nope. It's a Super CW Station, complete with clock, calendar, alarm (it alerts you with your own CW messages), Morse code reader, keyer with adjustable sidetone, random Morse code practice generator . . . and more. And you can build it when you read Sam Ulbing's "The N4UAU Super CW Station."

• Ready to try your hand at building an omnidirectional gain antenna? John Conklin tells how in "Collinear 5/8-Wave Omni Antenna for 2 Meters." Increase your gain by reducing your upwards RF.

• Besides being a perfect keyer, "The KK-1 from AEA" is like an old friend to reviewer Peter R. James WM4U, who once had a similar keyer he loved and lost. With 255-character buffer, 12 memories, and a whole lot of simplicity, it lets you use your keyboard for either CW or computer.

• Gordon West reviews "The SGC SG-230 Antenna Tuner." Is there a big difference in automatic tuners? Yup. Will this tuner work better than a solid-state toroidal inductive matching network? Infinitely so!

• It's always helpful to know your battery voltage and to keep it charged. Do both with a "Battery Monitor and Charger Controller," as described by Marion D. Kitchens K4GOK. This unit displays voltage in increments of .5 volt in a range from 10.0 to 14.5, enables the charging at 12.0 V, and disables the 110 VAC line at 14.0 V.

• Less than thrilled about learning Morse code? Tony Marchese N2YMW tells how to make it easier by practicing with "An Inexpensive Morse Code Keyer" you can build for under ten bucks. It'll provide you with automatic spacing and duration, variable character speed, long battery life, adjustable sidetone oscillator, and connectability to a transmitter.

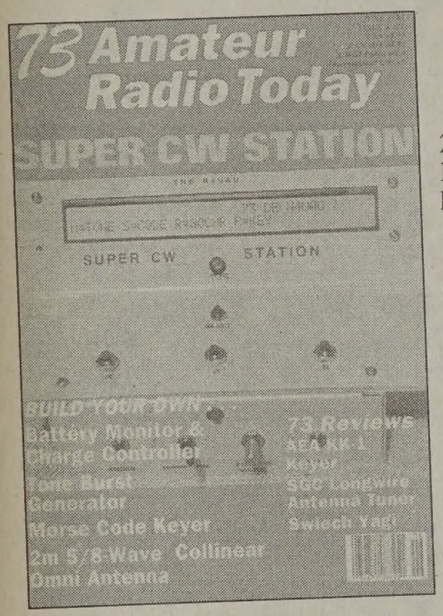
• To maximize power transfer to, and radiation from, your antenna, you have to resonate it and improve the match with the feedline. Carroll R. Markivee W0RKU has a suggestion for "Measuring the Antenna from the Shack" that will save you a lot of tedious trial and error.

• How much can you expect from a short 3-element yagi? Peter H. Putman KT2B answers in a review of "The COY2M3EL 'Stealth' VHF Yagi" that it's just perfect for making dozens of 2 meter FM contacts and will look and work as good ten years after you buy it.

• Want to use a tone burst to key up a repeater? Klaus Spies reached into his junk box and built a "Tone Burst Generator and Decoder" for under $5.

• You've also missed our regular monthly columns on radio direction finding, radioteletype, VHF/UHF/microwave, low power (QRP), questions and answers, hints, and more.

You should read the June issue, and *every* issue of ***73 Amateur Radio Today!*** Order now and save $27 off the cover price. You'll receive a one-year subscription (12 issues in all) to the best ham magazine money can buy, for just $19.97. For instant service call toll-free (800) 289-0388. Do it now! RF



What Does It Take

...to get you to subscribe to *73?* Sure, we could give you a lot of history to show how *73* has had a powerful influence on ham radio as it is today. But what you want to know is what can *73* do for you right now.

1) One of the most fun parts of hamming is buying a new piece of gear and using it. But you sure want to know all you can about it before buying, right? *73* has more equipment reviews than any other ham rag, and almost always has 'em first.

2) Unless you're a real nerd, you want to know how to get active on packet, the ham satellites, slow-scan, and all the other exciting adventures amateur radio has waiting for you. *73* has been the leader in new ham modes ever since it started. And Wayne was doing the same thing when he started *Amateur Radio Frontiers* magazine in 1951. He was pushing ham teletype then. Still is, for that matter. Then, as the editor of *CQ* for five years, he pushed SSB and NFM. Then, after being fired because *CQ* owed him too much money, he started *73,* where his long editorials have been urging hams to try new things, learn more, and be entrepreneurs, since 1960. Wayne's editorials have helped hundreds of hams become millionaires.

3) One of the more fun things in hamming is building gadgets. *73* has more simple construction projects than the other ham rags combined. Plus lots of reviews of kits. You'll have a ball with some of the QRP rigs and kits.

4) Antennas? You'll read about a ton of new ideas in antennas. Here's one area of hamming that you can experiment with and have fun.

5) Wayne's done just about everything there is to do in hamming, and he generally helped pioneer new modes. He's visited over 130 countries and operated from over half of them. He went on his first DXpedition in 1958 to Navassa as KC4AF. Almost got killed. So when he writes his editorials urging you to try something new, he's usually done it himself.

6) Once you start reading his editorials you'll be hounding the flea markets for back issues. With over a thousand of his provocative, and often controversial, editorials published so far, that'll keep you busy for a while. Wayne sure says what he thinks. But he does his homework first, so the chances are that if you don't agree with him, it may be you who needs to do the homework, not him. Wayne predicted the cellular telephone industry before it happened. He did the same with microcomputers, starting the first magazine in the field, and then with compact discs, again with a magazine. He's into cold fusion now with a new magazine. It costs $98 a year for a subscription, so you'll probably cry poverty and miss the next huge industry that's about to get started, and miss out on being a millionaire again. Tsk. But that's the price for being chintzy.

7) Speaking of chintzy, you might enjoy reading about Wayne's travels. He calls it being thrifty. He's written several of these travelogs with the day-to-day stories of his trips. You'll enjoy them. Check the Uncle Wayne's Bookshelf ad for details. You could do worse than read his ***Declare War*** book too. Thousands of hams have read and enjoyed it.

8) Meanwhile, at least read *73* so you can keep up with what's happening.

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Finally, a handy go anywhere rig that puts the fun back into ham radio. How about the DDS synthesizer that tunes in 10 Hz steps with exceptionally low noise for weak signal reception. Or, how about the built-in lambic CW keyer that has a digital readout of your CW speed. Perky 10 watt RF output (that's only 11/2S units below a 100 watt rig!) can be tuned down for true QRP operation. Included with the SX-20 is the hand mike with handy UP/DOWN buttons for remote tuning of the rig while driving — or biking — or boating. Available in both fully assembled and fun to build kit form, you'll find that the SX-20 will become your favorite rig.

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SX-20 20 meter SSB/CW Transceiver Kit Form.....$349.95
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Fits Icom, Yaesu, Alinco, Ramsey and Radio Shack rigs! Looking for a handy little speaker-mike to compliment your FX transceiver or other ICOM style handie-talkie? The Ramsey SM-1 speaker-mike is a beauty. It's only 1 1/2" wide by 2 1/2 inches high and has a handy clip on the back so you can easily clip it to your lapel or shirt. Its small internal speaker isn't going to break any eardrums but is very clear and has plenty of pop to be heard when worn. There's even a jack on the mike so when you plug it in, you still have the use of the speaker jack from your radio. Fits all Radio Shack, ICOM, Yaesu, Alinco and Ramsey rigs.

SM-7 Mini-Speaker mike, Fully assembled.....$24.95

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Matching case set for SCI, CSC ...$14.95

CW KEYER

Send perfect CW. Microprocessor keyer features 4 programmable memories of up to 26 words each, lambic keying, dot-dash memory, variable speed from 3-60 WPM, adjustable sidetone, keying to any rig and fully RFI proof. EAROM memory keeps messages up to 100 years - you'll go silent before the key! Includes built-in touch paddles or use your own. Easy assembly and matching case set available for a nice station look.

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Cramped for space? Get longwire performance with this desktop antenna. Properly designed unit has dual HF and VHF circuitry and built-in whip antenna, as well as external jack. RF gain control and 9V operation makes unit ideal for SWLs, traveling hams or scanner buffs who need hotter reception. The matching case and knob set gives the unit a hundred dollar look!

AA-7Kit.....$28.95 Matching case & knobset, CAA..$14.95

AIRCRAFT RECEIVER

Hear exciting aircraft communications—pick up planes up to 100 miles away! Receives 110-136 MHz AM air band, smooth varactor tuning superhet with AGC, ceramic filter, adjustable squelch, excellent sensitivity and lots of speaker volume. Runs on 9V battery. Great for air shows or just hanging around the airport! New 30-page manual details pilot talk, too. Add case set for "pro" look.

AR-1 kit $29.95
Matching case set, CAR $14.95

2M POWER AMP

Easy to build power amp has 8 times power gain, 1W in, 8W out, 2W in, 16W out, 5W is for 40W out. Same amp as featured in many ham magazine articles. Complete with all parts, less case and T-R relay.

PA-1, 40W pwr amp kit.....$34.95
TR-1, RF sensed T-R relay kit.....$14.95

MINI KITS

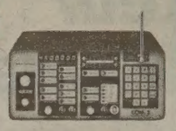
Ramsey carries a complete line of low cost, easy to build, easy to use functional kits that can be used alone or as building blocks in larger more complex designs. Mini-kits include audio amps, tone decoders, VOX switches, timers, audio alarms, noise-makers and even shocking kits! Call for our free catalogue!

QRP AMPLIFIER

For a slick little QRP boost, use one of the 20 Watt amplifiers. Needs only 1/2-2 watts of drive for full output, linear for SSB, AM or CW operation, power MOSFETs for high effieciency and multistage low pass filter for a clean signal. Built-in T/R relay for automatic switching, runs on 12-15 VDC at 2-4 amps. Add our matching case set for a complete station look.

Your choice of bands $49.95
Specify band: (QAMP-20, 30, 40, 80)
CQAMP Matching case set.....$14.95

2WAY RADIO SERVICE MONITOR



COM-3, the world's most popular low-cost service monitor. For shops big or small, the COM-3 delivers advanced capabilities for a fantastic price—and our new lease program allows you to own a COM-3 for less than $3.00 a day. Features • Direct entry keyboard with programmable memory • Audio & transmitter frequency counter • LED bar graph frequency/error deviation display • 0.1-10.000 µV output levels • High receive sensitivity, less than 5 µV • 100 kHz to 999.9995 MHz • Continuous frequency coverage • Transmit protection, up to 100 watts • CTS tone encoder • 1 KHz and external modulation.

COM-3 2 Way Radio Service Monitor $2995.00

FOXHUNT HEADQUARTERS

Locate hidden or unknown transmitters fast. The Foxhound direction finder connects to the antenna and speaker jack on any radio receiver, AM or FM from 1 MHz to 1 GHz. The antenna (a pair of dipole telescopic whips) is rotated until the Null meter shows a minimum. A pair of LEDs indicate to turn Left or Right. The Foxhound is ideal to use with a walkie-talkie. if you wish to transmit, go ahead, a built-in T/R switch senses any transmitted RF and switches itself out of circuit while you talk. It doesn't get any easier than this! We provide all parts except for a few feet of 1/2 inch PVC pipe avialable at any hardwar e store for a dollar or two. Add our matching case set for a complete finished unit. Be the one with the answers, win those transmitter hunts and track down those jammers, you'll do it all with your Foxhound.

Add some fun to your club events by having a transmitter hunt! Foxhunting is a craze sweeping the nation, but many clubs are missing out on the action because they lack the expertise or time to develop their own foxhunt transmitter. We set one of our most devious and sneaky engineers to the task of designing an easy to build and use, yet highly capable Foxhunt transmitter. A snazzy microprocessor controller has both preset and programmable transmission characteristics allowing you to easily set the difficulty level from "beginner" to "know-it-all"! The SlyFox, FHT-1, is crystal controlled in the 2 meter band (crystal for 146.52 included) with a power output of 5 watts that is adjustable by the controller.The transmitter is programmed to ID in CW or add our voice option if you really want to aggravate the troops - "Ha ha, you can't find me!" Join the fun, get rid of those stuffy old meetings and picnics, have a foxhunt!

DF-1 Foxhound direction finder kit.....$59.95 CDF Matching case set for DF-1 ....$14.95
FHT-1 SlyFox Foxhunt transmitter kit .$129.95 FHID-1 Voice ID option.....$29.95
CFHT Heavy duty metal matching case set for FH T-1 .....$29.95

PACKET RADIO

Two new versions are available for the Commodore 64 (P-64A) or the IBM-PC (P-IBM). Easy assembly NO TUNING". Includes FREE disk software, PC Board and Full Documentation. Kit form.

P-64A.....$59.95 P-IBM.....$59.95 CASE CPK.....$14.95

STEREO FM TRANSMITTER

Run your own Stereo FM radio station! Transmits a stable signal in the 88-108 MHz FM broadcast band up to 1 mile. Detailed manual provides helpful info on FCC regs, antenna ideas and range to expect. Latest design features adjustable line level inputs, pre-emphasis and crystal controlled subcarrier. Connects to any CD or tape player, mike mixer or radio. Includes free tuning tool too! For a pro look add our matching case set with on-board whip antenna

FM-10A Stereo transmitter kit.. $34.95
CFM Case,whip ant set..... $14.95

SPEECH SCRAMBLER

Descramble most scramble systems heard on your scanner radio or set up your own scambled communication system over the phone or radio. Latest 3rd generation IC is used for fantastic audio quality - equivalent to over 30 op-amps and mixers! Crystal controlled for crystal clear sound with a built-in 2 watt audio amp for direct radio hook-up. For scramble systems, each user has a unit for full duplex operation. Communicate in privacy with the SS-70. Add our case set for a fine professional finish.

SS-70 Scrambler /descramblerkit .$39.95
CSSD matching case set..... $14.95
SS-70WT Assembled
SS-70 and case set $79.95

MICRO-MIKE

World's smallest FM wireless mike. Smaller than a sugar cube - including battery and mike. Two sets of SMT parts supplied in case you are clumsy! Terrific audio pick-up (pin drop at 5 ft) and transmit range of 300 ft. We include the battery (watch style), electret mike and even a tuning tool! Be a James Bond and learn SMT too!

FM-5 Micro mike kit.....$19.95

CRYSTAL RADIO

Relive the radio past with a crystal set like your grandfather built. Uses genuine Galena crystal and catwhisker. Several different types of radios are built, including standard AM broadcast, shortwave and even WW II foxhole style. To compare modern semiconductor detectors, we include a diode for comparison. No soldering required and we even give antenna ideas. Radio for free, get it now before Clinton taxes it!

CS-1 Crystal set kit $19.95

DR. NI-CAD CONDITIONER/FAST CHARGER

Quit spending big bucks for replacement battery packs, rejuvenate and condition your batteries for peak capacity. Advanced circuitry has optimized discharge before charge to eliminate memory effect and to condition batteries that have been poorly cared for in the past. Quick charge rapidly brings battery to full charge in less than an hour-just 15 minutes for some types! And "top-off" charge mode squeezes every last bit of energy into each cell for the absolute most capacity. Switch-mode regulator controls constant current charge while being monitored by a negative delta-V system that cuts off the fast charge at the exact point of full charge-batteries are charged, not cooked! Charges NiCads or NiMH packs from 2 to 10 cells (easily expanded) and current capacities up to 10 Amp-hours. Runs on 12 to 15 VDC. Quit cooking your batteries, buying new packs, waiting hours for recharge, get a Dr. Ni-Cad today! Available in money saving kit form or wired and tested with case at a special price. Kit builders: add our matching case set for a snazzy finish.

DN-1 Dr..Ni-Cad conditioner/fast charger kit $49.95
CDN Matching case set.....$14.95
DN-1WT Fully assembled Dr. Ni-Cad with case.....$89.95

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